American Electrical Manufacturers and Export Business—*The ascendency of electric heating, and other articles on broadening the applications of electricity.*

Electrical World

New York, September 23, 1916 McGraw Publishing Co., Inc. Vol. 68, No. 13 10c a copy

SEP 23

OF

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WRITE FOR CATALOG 16

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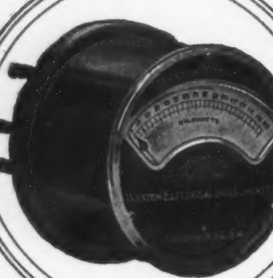
Polyphase Wattmeter
Semi-Flush Type

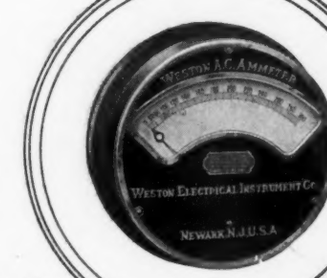
Model 215
Power-Factor
Meter



Model 216
Polyphase Wattmeter
Full-Front Type

Model 151
Voltmeter

Model 214
Frequency
Meter



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Weston Electrical Instrument Company

Electrical World

The consolidation of ELECTRICAL WORLD AND ENGINEER and AMERICAN ELECTRICIAN.
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Raising the Standards of Lighting

TO concentrate all branches of an art upon a problem in order that the average conditions may be greatly improved is altogether worth while. The Illuminating Engineering Society is to be congratulated first, upon having a problem that is well worth working on and, second, in gradually broadening its conception of the many angles of that problem. The annual meeting in Philadelphia this week, the papers, the exhibits and the series of lectures at the University of Pennsylvania, all are being carried out for the advancement of better lighting. We have called attention several times to the essentially practical character of the illuminating problem. Raising the efficiency of light courses is only part of the question. Designs for fixtures and glassware for better control are also important, but only a part. Architectural requirements enter in large measure and last but not least comes the personal equation, which brings the variants of psychology into the general problem. The Illuminating Engineering Society provides a forum for the discussion and distribution of the best thought on illumination in the country. The work of the society permits the broadest interpretation of its name. The scientific, artistic and practical business sides of the problem are all represented in this association for raising the standards of lighting. We hope this next year to see its membership increased by more architects, more fixture manufacturers and distributers, so as to bridge even more securely the gap between theory and average practice that is constantly narrowing.

Trading Between Continents

CONDITIONS in the trade of the world are extraordinary. Buyers in South America, in India, in Japan, in Russia, in Australasia, are in urgent need of electrical products. The war has cut off the established channels of commerce with the trading nations of Europe. A condition has arisen in which the world is a seller's market. The inner nations of Europe, cut off by the outer cordon, have little or no trade communication with their former markets. But this situation cannot be taken advantage of by the outer ring of nations with free communication, because of the necessity of conserving their manufacturing energies primarily for the production of war materials. On the face of it the market is open only to American manufacturers. This unprecedented situation finds the American manufacturer, first, pushed for labor and raw materials to meet domestic demands and, second, without the established credit and financial machinery or shipping facilities necessary to meet the demands of foreign markets.

The big facts are so apparent, however, that for the first time American manufacturers, as a whole, have awakened to the possibilities of foreign trade and its relations to the tremendous internal business which we carry on between our forty-odd states. In the electrical manufacturing business our large companies have long established foreign trade organizations and machinery for doing business. That there is opportunity for the smaller establishments, however, is proved by the knowledge that there are many average-sized establishments which are selling abroad successfully. Fundamentally, trading abroad is no different from trading across our own continent. The United States has variegated demands and we have met them successfully. The great Northwest offers a market quite different from that of Texas. Buyers' needs, shipping, packing, credit machinery—all these are details. We need to think in terms of continents rather than states and to find it as natural to have customers on our books in India, in Russia and in Japan as in Maine, in California and in Texas. It is with the general situation in mind that we call attention in this week's issue to certain fundamental trade conditions and anticipate presenting a series of articles of the foreign-trade movement as it affects our domestic electrical manufacturing business.

Higher Costs Mean Higher Values

DISCUSSION of the present high costs of materials and labor leads to interesting conjectures as to the ultimate effect which they will have upon central station property values. In theory the good buyer buys only when prices are low, but as he sometimes lacks both capital and the demand which justifies extensions, his practice does not always conform to this policy. As a matter of fact he buys when the demand for service requires plant enlargement, but this policy has been modified in the last year by some companies which had an abnormal "war order" demand that could not be permanent. When lasting business at remunerative rates is in sight the required additional facilities, whatever their cost may be, are usually provided without much delay; and therefore, even if the current level of material and labor prices should be long maintained it will be found that central stations will provide the necessary service. But if present costs should be long continued the chances of a return to the old low levels will be diminished. Of course, there will be a reaction, but when prices have gone so far upwards and buying is undiminished in eagerness the day of decline disappears farther into the future and the probable extent

of the decline, when it does develop, is lessened. This is illustrated by the frequent experience with wages which once advanced are restored only with great difficulty, if at all, to as low a level as that which prevailed before the advance. If this era of mounting prices is prolonged indefinitely or if former low prices should not be seen again it would mean that greater investment values would exist in established central station properties. However public commissions might try to deride such values as an element in rate-making or capitalization, a permanently higher level in costs will produce them and they will be a factor which it will be difficult to ignore.

The Sperry Searchlight

WE describe in this issue what is perhaps the most interesting development in searchlights which has yet appeared. The conditions of modern warfare have given the searchlight a place of exceptional importance, far greater than it has every before possessed. The initial appearance of the searchlight in war was during the siege of Charleston, S. C., in 1863, in the form of a calcium light which over a moderate range did effective work. The electric arc was soon in the field, and has been gradually developed through successive wars and intervals of peace up to the present time without any very great modifications. A couple of years ago we described the Beck searchlight, which used a mineralized carbon burning in alcohol vapor. In other words, this particular form of lamp took advantage of the flame arc burning under special conditions, thereby considerably increasing the intrinsic brilliancy of the crater, and hence facilitating both increase of light flux and close focussing.

The Sperry searchlight described in this issue uses a positive carbon cored with light-producing material which for obvious reasons is not specified. Instead of the electrodes being at a large angle with each other, the positive carbon is horizontal and the negative one faces it at only a moderate angle, so that the arc stream from the negative electrode bears full upon the crater and tends to keep the blazing vapors from being quickly dissipated. The cored positive carbon is kept in constant rotation, evidently to maintain a symmetrical crater and thereby insure a uniformly luminous source.

Both electrode holders are air cooled by forced draft, one electrode having radiating disks. By using a relatively small negative electrode and holder, the maximum light is permitted to fall on the mirror. A most striking fact is that for a searchlight taking 150 amp. the positive carbon is only 5/8 in. in diameter and the negative but 7/16 in. The result is an enormously high intrinsic brilliancy in the deep and narrow crater of the positive carbon, which is assisted by allowing the electrode tips to become as hot as they will without cooling them, as in the case of the Beck lamp. This is of the order of magnitude of 500 cp. per square millimeters, or about three and one-half times that of the standard carbon arc used in searchlights. For a given power, therefore, the new source of light is much smaller than the old, and permits of more exact focusing. We shall follow the development of this most important searchlight with the greatest interest. The United States government needs the very best searchlight it can get for the imperative needs of our Navy, and it is most gratifying to have so striking an advance made in this direction by American ingenuity and engineering skill.

Tests on Oil Switches

IN this week's digest reference is made to certain tests on oil switches, recently reported by a Swiss electrotechnical committee, and abstracted in the London *Electrician*. This committee has been investigating the behavior of oil circuit breakers, on a moderate scale, under practical conditions and has found that when an oil switch opens under load, the voltage across the contacts may rise considerably above the normal operating value. If it opens during a short circuit, it has to break an arc, accompanied, perhaps, by a large power overload. There is a tendency to volatilize the oil between the contacts and to carry across a jet of metallic vapor. In order that the device may operate effectively and quietly, it should be able to suppress the arc completely at the next zero point of the current wave. If it fails to do this and the arc persists until the next current alternation sets in, the chances of the quiet extinction of the arc are greatly reduced.

It is pointed out as a result of the tests that the power factor of the overload at the moment of opening has a great influence upon the behavior of the apparatus. On a non-inductive load the arc is much more easily extinguished than when the load is powerfully inductive at the moment of disruption. The recommendation of the committee is toward the use of a multiple-break circuit breaker, so constructed that current-limiting resistance or resistances may be injected into the circuit before the final opening occurs. It is pointed out, however, that if the pre-inserted resistance is not properly chosen, the load on the device may be almost completely thrown on at the preliminary step, so that no advantage is obtained from the multiple-step operation.

In this country the rule is to rely on one and only one step in the rupture, and so to proportion the parts of an oil circuit breaker, that it is able to operate satisfactorily, under any reasonable conditions of short circuit, at the place where it is installed. This calls for a standardization of circuit breakers and a classification by voltages and maximum kilovolt amperes of arc at rupture. Practice has shown that by allowing for t[h]e maximum power that a short-circuit arc could deve[l]op at the point of the circuit, where the circuit breaker is installed, proper provision for accidental short-circuits can be made with security. There is ample opportunity, however, for researches directed toward increased knowledge of these intricate switching phenomena and toward subsequent improvements in this important type of protective device.

Wave Form Standards

AT the recent convention of the A. I. E. E. in Seattle, a paper by Dr. Frederick Bedell on wave form standards called forth an interesting discussion. The question of inductive interference of circuits has been raised in a particularly acute form on the Pacific Coast, and there have been serious proposals to penalize generators which put upon circuits, particularly those near telephone lines, irregular wave forms likely to increase conductive disturbances. Since this penalizing if pushed too far may lead to needless expense, it is important to settle on something like standard limits of wave form which may reasonably meet all the various requirements. Most of the inductive trouble comes not from the low frequency fundamental, but from the odd harmonics, very often the third, which set up disturbances falling with specially serious force on the neighboring telephone systems.

The comments on Dr. Bedell's paper brought out interesting conclusions. The admittance form of standard proposed by the author can be made to give a pretty clear idea of the conditions within somewhat restricted limits. The consensus of opinion seemed to be that the actual situation was perhaps a little too complex to be handled by any such simple method of rating. It would certainly appear that a careful study of the practical magnitudes of the harmonic components in a wide variety of generators must be made before the situation can be cleared up and methods of rating for wave form standardized. Some machines are exceedingly sensitive to change in load conditions as respects the wave form, and inasmuch as in general it is the loaded line which must be considered any criterion applied to a machine, particularly one whose characteristics are not well known, should naturally be made as nearly as possible under its normal load conditions.

In the early days of power transmission a sine-wave machine was considered highly desirable, and so indeed it is; but its cost is apt to be disproportionately high and it is likely to have certain characteristics which are at times not altogether desirable. The tendency of late has been, perhaps, to go too far in the other direction, since long experience in transmission has shown that engineers were rather more scared than hurt by departures from the theoretical form. It will require considerable work to thresh out the reasonable limitations which ought to be enforced for the reduction of inductive disturbances, but the work done by Dr. Bedell and his colleagues is a good step in the right direction, and ought to lead to sound practical results.

The Errors of the Integrating Sphere

PHOTOMETRISTS have fallen back on the Ulbricht sphere as by far the most convenient method of getting spherical candlepower which, particularly since the coming of gas-filled incandescent lamps, has been the important fact in photometry. It is well known that while one can very easily get an approximate mean spherical value in this way, there are certain sources of error which may and do enter, particularly in cases where the distribution from the light source is of a very unsymmetrical character, as in certain types of arc lamps and incandescent units equipped with shades or reflectors. The absorption of light due to the presence of such a unit, and to the necessary use of screens for the observing window introduces an error in the result which may at times, particularly in using a rather large unit in a rather small sphere, rise to an unpleasantly large value. For instance, in the ordinary screening of the window a certain amount of the sphere is cut off from the radiant and its effect somewhat varied according to the distribution of the light. Proper adjustment of the screen for its use, multiple screens and other precautions materially reduce this difficulty, but the outstanding errors may still reach several per cent in case one is dealing with a light source which produces a very unsymmetrical illumination.

F. A. Benford, Jr.'s paper on this topic, read at the Philadelphia convention of the Illuminating Engineering Society this week, presents an interesting analysis of the difficulties which are encountered in sphere photometry, and describes a very ingenious form of compensating screen intended to correct the sphere readings even for cases of extreme asymmetry. The results quoted show that by use of the device described it is possible to cut down the errors to 1 per cent or less even in rather extreme cases, such as photometering a much shaded 200-watt gas-filled lamp in a 1-meter sphere. Discussions of this sort are of great practical benefit since the increasing use of the sphere is likely to lead, unless care is taken, to some unpleasantly divergent results.

The Coming Issues

IN next week's issue of the ELECTRICAL WORLD, which is the fifth number in September, a leading article will discuss a substation arrangement by which alternating current service is furnished to a large office building from a central station system. A second article will take up the requirements of steel rolling mill electric drives and present a graphical solution of loads imposed upon motors. The first issue of October will contain in addition to the usual engineering and technical articles and departments, discussions on public policy and broad business topics. An interesting and practical article entitled "Graphical Analysis of Managerial Problems," with an engineering as well as a managerial appeal, will be contributed by Edwin D. Dreyfus. The second issue of the month, which will be dated Oct. 14, is the number regularly devoted to practical engineering topics and problems pertaining to station and operating practice. In that number an interesting article will take up the operating features of a large Eastern transmission network. ELECTRICAL MERCHANDISING for September was issued on Sept. 15, and presents in an attractive way to the electrical trade a cup brimful of commercial suggestions and helps to the man who sells.

Chronicle of Events of the Industry and of Important Movements in the Field

NEWS OF THE WEEK

Reports of Conventions and Meetings of Electrical Associations and Societies

IRON AND STEEL ELECTRICAL ENGINEERS IN CONVENTION

Officers Are Elected—Operating Records, Direct Current Steel-Mill Motors and the Purchase of Central Station Energy Are Discussed

At the tenth annual convention of the Association of Iron & Steel Electrical Engineers at the Hotel La Salle, Chicago, Ill., from Sept. 18 to 22, the first session was entirely devoted to association business. At this meeting the following officers were elected: President, F. D. Egan, Pittsburgh; first vice-president, C. A. Menk, Homestead, Pa.; second vice-president, S. C. Coey, Youngstown, Ohio; secretary, John F. Kelly, McKeesport, Pa.; treasurer, John Farrington, Steubenville, Ohio. The association also revised its constitution, increasing the dues for associate membership from $5 to $7.50 per year, and admitting to membership companies producing iron and steel. These concerns will be admitted on a firm membership basis, paying $25 to $100 per year, according to the number of employees on their payroll.

At the first open meeting two papers were presented, namely, "The Value of Records to an Operating Engineer," by Ray S. Huey of Chicago, Ill., and "Cost Versus Upkeep of Direct-Current Motors," by A. M. MacCutcheon of Ampere, N. J. Mr. Huey's paper impressed upon the delegates the necessity of keeping reasonably accurate maintenance records on all equipment. Only by this method, said he, is it possible to ascertain whether or not it is economical to purchase higher-priced equipment or cheaper equipment to replace a machine when it wears out. He cautioned the delegates, however, against the danger of carrying the matter of keeping records too far. It is generally unnecessary to employ additional clerical assistance for this work.

In the discussion it was suggested that the association should standardize record keeping for its members. It was also pointed out that the installation of curve drawing instruments is a means for speeding up any lagging department.

Mr. MacCutcheon's paper, written from the viewpoint of a designing engineer, pointed out the fact that the construction of a mill-type motor costs the manufacturer more than a common machine. He showed in detail how the addition of each feature adds its share to the cost. In closing he suggested that the motor manufacturer would be glad to know what sort of motor the steel mill people would like to have produced for them.

In the discussion he was rewarded with a wealth of comment. It seems to be the consensus of opinion that the steel mill men want a standardized motor; that is, a motor which they can buy to-day with some assurance that the manufacturer will still be producing it commercially several years in the future. They expressed a desire for this type of machine so that they could avoid carrying a large stock of repair parts. The use of ball-bearing motors was also commented upon, and it seems to be the opinion that for many kinds of mill service, and especially for mine locomotive service, the adoption of some sort of non-friction bearing must eventually arise.

PURCHASED ENERGY FOR STEEL MILLS

At a later meeting the report of the central station power committee's report was presented. It would appear from the report that the power requirements of steel mills are quite large, ranging from 1000 kw. to 10,000 kw.; the load is characterized by large peaks and the power factor varies from 65 to 80 per cent. Central stations in soliciting the business take into consideration the size of the installation, the diversity factor and the power factor of the load. Steel mills purchase more than 300,000,000 kw.-hr. a year from central stations, and that amount is rapidly increasing. The rate is less than 1 cent a kilowatt-hour.

The discussion of the report of the central station power committee occupied the greater part of one morning. It seemed to be the opinion of the operators of the larger steel mills that they could produce power as cheaply and as reliably as central stations. Operators of small mills where the process begins with billets and is carried through to a finished product seemed, however, to favor the use of central station power. The deciding factor in these cases, of course, was the presence or the absence of gases which might be used as fuel. P. H. Stambaugh of Youngstown, Ohio, suggested that even in plants where gases are available the peak of the gas flow seldom coincides with the peak of the power demand. He proposed, therefore, that a co-operative agreement in which central stations purchase gas for fuels from the steel mills and in which the steel mills purchase electrical energy from the central stations would be advantageous to both. The discussion also brought out the fact that power installations to utilize waste heat are so expensive in first cost that the cost per kilowatt-hour generated is usually near what it could be generated for in a coal-burning plant.

At the joint session with the American Institute of Electrical Engineering Wednesday four papers were presented as follows: "Underground Distribution Systems," by George J. Newton; "The 'Unaflow' Engine," by W. Trinks; "Steel Conductors for Transmission Lines," by H. B. Dwight; "The Advantages of Modern Types of Direct-Current Machines," by David Hall.

Mr. Newton's paper, which was read by H. P. Gear, Chicago, described a method for designing underground distribution systems and contained many detailed suggestions for reducing the cost of installation and for insuring efficient service from it.

The discussion of this paper dealt largely in construction details that have been found effective in existing systems. Professor Trink's paper on the "unaflow" engine showed this type of unit to be economical for steel mill work where prime movers in sizes less than 8000 kw. are required. The discussion of S. C. Coey of the Youngstown (Ohio) Sheet & Tube Company, brought out the fact that two of these units rated at 1400 hp. and at 1000 hp., respectively, are now being installed in his plant. The larger unit is thought to be the largest "unaflow" engine yet built in this country. Discussion of the paper indicated that steel mill operators in general are more favorably inclined toward electric drive than toward steam engine drive.

The paper of H. B. Dwight, Ontario, Canada, set forth test data on steel conductors for transmission lines which have heretofore been published in German

technical papers. The author said further steel cables will not generally be economical on main transmission lines except for long spans and for high altitudes, where corona is excessive. He advised that steel cables for alternating current should be finally stranded and the different groups of wires should be spiraled in opposite directions and suggested that medium priced grades of steel seem to give better results with alternating current than some more expensive grade. The characteristic increase of resistance and reactance of steel with increase of current or frequency may be valuable, concluded the speaker, for limiting lightning, switching surges and short-circuit currents. The discussion indicated that there is a demand for test data on American wire to show what grades of steel wire and what sizes of steel wire are best for transmission work.

Mr. Hall's paper outlined the advantages of modern direct-current machines with commutating poles and compensating windings. Discussion of this paper indicated that the steel mill men are not in hearty sympathy with changes in motor design which tend to complicate the machines.

Large Order for Electric Trucks Placed in Chicago

The Consumers Company of Chicago has placed what is thought to be the first large order for electric trucks to be used in hauling ice and coal. In all twenty-six trucks have been purchased for this purpose from the Walker Vehicle Company. Twenty-one of the fleet will be of the 3-ton size and the remaining units will be 5-ton trucks. To make the trucks available for both summer service in hauling ice and winter service in hauling coal two sets of bodies will be used. Energy for operating the trucks will be purchased from the Commonwealth Edison Company. The Consumers Company will provide its own garage service.

Among the vehicle men this order takes on added importance since the Consumers Company had been using a fleet of twenty-five 5-ton gasoline trucks for several years. The first general announcement of this order was made at the weekly luncheon of the Chicago section of the Electric Vehicle Association, where E. S. Mansfield, of Boston, was the speaker of the day. In closing the contract J. C. Dickson acted for the Walker Vehicle Company.

Papers for New England Section N. E. L. A. Convention

Plans are maturing for the fall convention of the New England Section of the N. E. L. A., at Pittsfield, Mass., Oct. 17 to 20 inclusive. The program as completed follows: Wednesday, Oct. 18, "Industrial Heating and Large Power Users' Day"; "Obtaining Large Power Business," by W. C. Durant, New England Power Company, Boston, Mass., and Warren B. Lewis, consulting engineer, Providence, R. I.; "Determining Demand of Large Power Users," by R. S. Hale, Edison Electric Illuminating Company, Boston, Mass.; "Central Station Power for Large Power Users," by David Elwell, Lockwood, Greene & Company, Boston, Mass.; "Industrial Heating," by E. F. Collins, General Electric Company, Schenectady, N. Y.; report of heating research committee. On Thursday, Oct. 19, the report of the accounting section committee will be presented, including the following subjects: "Value of Clear and Complete Accounting Records in Profitable Business Development," by F. L. Hall, Narragansett Electric Lighting Company, Providence, R. I.; "Value of a Complete Accounting System in Getting Out Capital Securities," by H. A. Gidney, Charles H. Tenney & Company, Boston. In the afternoon the report of the public policy committee will be submitted, followed by discussion. On Friday, Oct. 20, the report of the Commercial Section committee will be presented, including the following subjects: "The Commercial Section—Its Big Work," talk by E. A. Edkins, chairman, Chicago; "Electric Ranges," by A. L. Smith, Jr., Edison Electric Illuminating Company, Boston, Mass.; "Electrical Appliances and Merchandising," by A. H. Allcott, Narragansett Electric Lighting Company; "Effect of Gas-Filled Lamps in Municipal Street Lighting," by John West, Charles H. Tenney & Company; "Store Lighting," by A. H. Heininger, Edison Electric Illuminating Company, Boston; and possibly a paper on "Concentric Wiring," by R. S. Hale, Edison Electric Illuminating Company, Boston. Headquarters will be at the Maplewood Hotel, and a reception and dance will be held on the evening of the seventeenth.

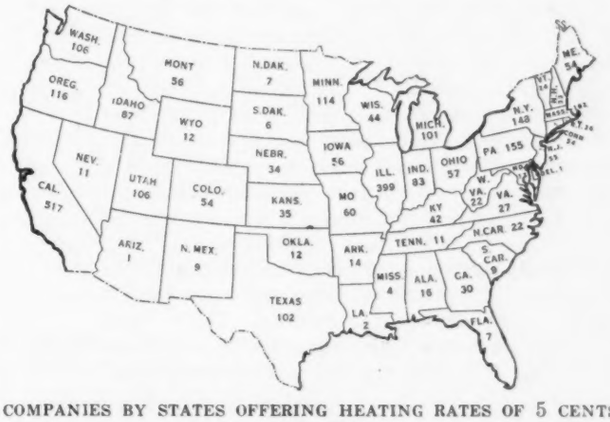
Cleveland Railway to Purchase Central Station Energy

At a conference in Cleveland, Ohio, on Sept. 15 it was decided to abandon and scrap the Cedar Avenue power station of the Cleveland Railway as the result of a report from Sargent & Lundy, consulting engineers of Chicago, and to purchase the necessary energy for operating the system from the Cleveland Electric Illuminating Company. A new 12,000-kw., 60-cycle substation will be erected on the site of the old powerhouse.

Electric Heating Rates

The rapidly increasing demand for electric ranges with their convenience, reliability and cleanliness has led to an investigation of rates for electric energy by the Society for Electrical Development. The accompanying map shows the number of communities having special cooking rates and the location of these communities by states.

In analyzing the compilation of rates for electric cooking in the United States the interesting fact de-



COMPANIES BY STATES OFFERING HEATING RATES OF 5 CENTS AND LESS

velops that of some 3000 communities listed where rates are 5 cents or lower, 1884 are located in the eastern half of the country, and 1250 in the western half, or, taking the Mississippi as the dividing line, 1638 are east of the Mississippi as against 1506 west of the Mississippi River.

Contrary to the general impression that low rates for cooking are largely confined to the western states,

it will be seen that central stations in the East have also realized the advantages of this load and are offering special rates as an aid in building it.

CLOSING SESSION OF INDIANA ELECTRIC LIGHT CONVENTION

Pole-Line Material, Plant Construction and Safety Rules Are Topics of Papers—Copies of National Electrical Safety Code Promised Soon

At the final session of the Indiana Electric Light Association at Fort Wayne on Sept. 14, four papers were presented. G. L. Lindsley of Lindsley Brothers Company, Chicago, in one of these papers on "Pole Line Construction," presented engineering data and experience calculated to show the great strength and long life of Western cedar poles. The paper also described methods of pole-butt treatment.

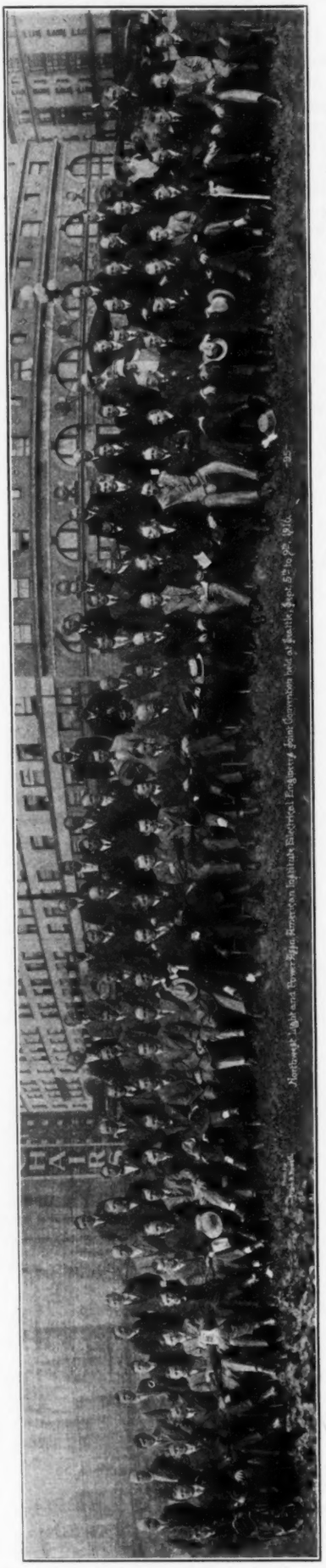
C. B. Hart of the Fort Wayne & Northern Indiana Traction Company, in a paper entitled "The Spark Plug of the Electrical Industry," likened the central station to an automobile in which the spark plug was represented by the new-business department. His paper was an appeal for enthusiasm in selling. It also pointed out to the new-business man the value of entering actively into the civic work of his home city.

Speaking on the "Development of Central Station Motor Loads," W. H. Patterson of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., outlined a plan for conducting a model power survey. He also presented data to show that only about 10 per cent of the industrial power in Indiana is connected to central station lines. He cited these facts to show the value, and in some cases the necessity, of co-operative sales efforts between central stations and electrical manufacturers in securing power business.

E. J. Condon, Jr., of Angola, Ind., in a paper on "Inductive Interference," suggested the advisability of making joint agreements with telephone and telegraph companies in which both interests share the expense of the ultra-expensive construction for preventing inductive trouble. He also expressed the opinion that the rules of the National Electrical Safety Code would add greatly to the expense of building transmission and distribution lines in Indiana.

The last paper of the day was presented by W. J. Canada, of the Bureau of Standards at Washington, D. C. He outlined the origin and nature of the National Electrical Safety Code and asked the Indiana association to co-operate with the bureau in two ways. First, he asked the association to recommend that the code be given an active trial by making applications of it in the coming year. Second, he requested that measures be taken to combat the adoption of any rules conflicting with those of the bureau, and asked that the movement for final adoption of the National Electrical Safety Code be given support after the rules have been tried, corrected if necessary, and reissued. Mr. Canada said in closing that enough copies of the rules are expected from the printer within a short time to supply anyone who will ask the Bureau of Standards at Washington, D. C., for them.

The election of officers for the ensuing year was reported as follows: President, Sam W. Greenland, Fort Wayne; vice-president, J. P. Ohmer, Elkhart; secretary-treasurer, Thomas Donohue, LaFayette; executive committee: E. J. Condon, Angola; T. F. Grover, Terre Haute; A. C. Blinn, Evansville; C. C. Perry, Indianapolis, and T. F. English, Muncie; advisory committee: J. W. Robb, Clinton; F. A. Bryan, South Bend, and P. H. Palmer, Kokomo.



Delegates in Attendance at the Joint Meeting of the American Institute of Electrical Engineers and the Northwest Electric Light & Power Association Held in Seattle, Wash., Sept. 5 to 9

Accounts of the meetings were published in the issues of the ELECTRICAL WORLD for Sept. 9 and 16 and the remaining details of the sessions of the American Institute of Electrical Engineers at which papers dealing with inductive interference, insulator testing, and electric heating formed the chief topics for discussion are published elsewhere in this issue.

A. I. E. E. STANDARDIZATION RULES

Additions and Deletions Made in Standardization Rules, with Outlines of Principal Changes

Although a number of changes, deletions and additions have been made in the 1916 standardization rules as published in the September issue of the A. I. E. E. proceedings they do not differ radically from those of 1915. The new sections which have been added, deal with the limiting observable temperature for inclosed motors and generators (386A), test pressures for standard devices produced in large quantities (485A), dielectric tests for meters and instruments (510A), the lay of wires in cable or strand (657), continuous rating of automobile propulsion motors and generators (835) and efficiency and losses of same (839).

The sections which have been deleted referred to the following subjects: Efficiencies based on conventional losses (424), no-load core loss at internal voltage corresponding to rated load (453), information on the rating plates of machines (623 to 630), exposure to illumination (859), brightness (861), normal brightness (862) brightness expressed in candles per square centimeter (865), resonance curves (1021 to 1023), radio selecting (1025) and rating of radio sets (1029).

Aside from minor typographical corrections, changes have been made in the following sections: 57, 58, 100, 114, 115, 131 (footnote), 225 to 232 (renumbered 225 to 236), 266, 275, 276 (footnote), 283, 285, 303, 307, 312, 320, 340, 342 (renumbered 305A), 349 (including footnote), 350, 375 (Table III), 379, 390, 406, 421, 422, 430, 432, 436, 440 to 445, 452, 459, 470, 471, 507, 508, 540, 562, 587, 600 to 610 (renumbered 600 to 611), 653 to 655, 679, 692, 800 (footnote), 1000, 1003, 1006 to 1008, 1011 to 1014, 1019, 1020, 1024, 1026 to 1028, 1108, 1110.

NATURE OF PRINCIPAL CHANGES

Many of these changes were simply revisions in the wording and did not change the sense considerably. The principal changes were as follows: Section 266 was reworded to say that temperature rises specified in the rules apply to ambient temperatures up to and including, but not exceeding, 40 deg. C. for air and 25 deg. C. for water. It was pointed out in Section 283 that nominal ratings were not recommended for automobile propulsion motors and generators. Standard durations of equivalent tests for machines operating under specified duty cycles were extended to include fifteen-minute ratings. In Section 320, the lowest temperature limit for tests was changed from 20 deg. C to 15 deg. C. Under the section devoted to the resistance method of determining the temperature of different parts of machines an additional footnote has been inserted to the effect that in transformers of 200 kva. and less the measured temperature shall be increased 1 deg. for every minute between the instant of shutdown and the time of the final temperature measurement, providing the time does not exceed three minutes.

To supplement the ruling on temperature of commutators, a sentence has been added to the effect that these temperatures are intended only to protect the insulation of the commutator and adjacent parts and not as a criterion of successful commutation. It was pointed out under the section on plant efficiency that individual efficiencies obtained during plant efficiency tests may be different from those obtained at 75 deg. C. Where load is not specified in reference to efficiencies, it is always understood that their rated load is meant. The efficiency specified for alternators and transformers is now understood to mean the ratio of kilowatt output to kilowatt input at the rated kilovolt-amperes and power factor. In making tests on synchronous motors and generators it was pointed out that the I^2R loss in all windings and the rheostat losses should be based on the kilovolt-ampere instead of the kw-rating of the machine. The brush contact drop of automobile propulsion motors and generators should be determined experimentally, provided they are low-voltage machines. Brush friction and brush contact loss is negligible in synchronous motors and generators except in a revolving armature type.

HOW THE RULES AFFECT ALTERNATING-CURRENT TESTS

After no-load core losses have been obtained in the usual manner, additional readings should be taken with the machine excited so as to produce at the terminals a voltage corresponding to the calculated internal voltage for a load under consideration. The internal voltage of synchronous motors shall be determined by correcting the terminal voltage for resistance drop only. With the rotor of an induction machine removed for making stray load losses test, the input to the stator should be made with different currents at rated frequency. The curve plotted with the values gives the combined I^2R and stray load-losses due to eddy currents in the stator copper. By deducting the I^2R loss determined from the resistance, a value will be obtained which represents the stray load losses, corresponding to the various currents.

When synchronous machines are designed to start with the fields open circuited and connected in series, the fields shall be tested with 5000 volts for less than 250-volt excitation and 8000 volts for 275-volt to 750-volt excitation. When normal voltage is referred to in the voltage tests for phase-wound motors and induction motors, it means the voltage between slip rings on open circuits at standstill with normal voltage impressed on the primary. A slight change has been made in the table giving sphere-gap spark over voltages. With 62.5 mm. spheres, the sparking distance for 30 kv. is 14.1 mm. instead of 13.5 as previously given in the table.

ADDITIONS TO TRANSFORMER AND CABLE SECTIONS

Several changes have been made in the section devoted to transformer connections, among which is a rule requiring that a manufacturer shall supply with each transformer a complete diagrammatic sketch of the internal connections. Paragraphs are also included on methods of indicating tap connections, and diagrams showing the angular displacement between high and low voltage windings of six-phase transformers. Two new tables have been presented giving the proposed standard stranding of flexible cables and apparatus cables. When making tests on insulation resistance, it is now advocated that the conductor be maintained negative to the sheath or water. Many of the definitions of radio quantities have been revised.

Decision in Wireless Detector Case

The contention of the Marconi Wireless Telegraph Company of America that the De Forest Radio Telephone & Telegraph Company had, in the audion amplifier, infringed its rights to the sole use and ownership of the patent covering the Fleming detector was sustained Wednesday in an opinion written by Judge Julius M. Mayer of the Federal District Court. Dr. John Ambrose Fleming invented the detector in 1905, and almost immediately thereafter the Marconi Company obtained the rights to its use. According to Dr. De-Forest the case will be appealed. The suit was begun two years ago, and since that time has undergone various delays, the claims and counter claims involving many technical features of wireless operation. These were brushed aside by Judge Mayer who preferred, he said, demonstrable facts.

Convention of Illuminating Engineers

President Steinmetz in Address at Philadelphia Shows Why Future Radical Advances in Lamp Efficiency Are Likely to Come in the Fields of the Luminous Arc and of Electrical Luminescence—Maximum Practical Efficiency of Tungsten Lamps Now Being Approached—Five Hundred Delegates Register for Tenth Annual Convention

A PROGRAM of unusual scope and interest marked the tenth annual convention of the Illuminating Engineering Society, held at Philadelphia, this week, and attended by nearly 500 delegates drawn from all divisions of the lighting industry.

The three-day convention was followed by the course of lectures held jointly under the auspices of the I. E. S. and the University of Pennsylvania. This course, which was inaugurated on Wednesday evening, with a program of addresses by Provost E. F. Smith, Dr. C. P. Steinmetz, Dr. E. P. Hyde and W. A. Durgin, will be continued at the University during next week and will be followed by an inspection tour to take in notable lighting installations at Philadelphia, New York, Boston, Schenectady, Buffalo, Niagara Falls, Cleveland and Chicago.

Dr. Steinmetz' presidential address on "Present Aspects of and Future Prospects for Lighting Sources," opened the convention, following the welcome to the city tendered by E. B. Cattell, city statistician of Philadelphia, and the response by Past-President L. B. Marks.

Dr. Steinmetz on Illuminants of the Future

In the course of his address Dr. Steinmetz pointed out that comparatively small further progress in lamp efficiency is to be expected from incandescent sources, but that the greatest promise of approaching the theoretically-possible light production of 300 to 400 lumens per watt, lies in the direction of the luminous arc and of some form of electro-luminescence. Already an efficiency of 100 lumens per watt (about 8 cp. per watt, or 0.12 watt per candle) has been achieved in the laboratory with high-power luminous arcs on the one hand, and on the other there has been demonstrated the very high efficiency of luminescence in the case of substances like willemite, as measured from energy input to light output—although obviously some more efficient means of electrically exciting the luminescence remains to be discovered.

Any attempt to improve the efficiency of a light source, explained Dr. Steinmetz at the outset of his address, must center upon the radiating element which transforms the received electrical energy into light. Here, as elsewhere in physics, if the energy transformation proceeds from a high form of energy to a similar form or to a lower form, extremely high efficiency is possible. On the other hand, transformation from a low form, like heat, to a high form, like mechanical energy, must always be attended by inefficiency; while transformation between two energy forms of similar degree, like magnetic energy and electrical energy, takes place easily.

Great Possibilities in the Luminous Arc

The nearest to direct conversion of electrical into luminous energy now appears to take place in the luminous arc, and it is here, said Dr. Steinmetz, that radical advances in efficiency may be expected. Already experimental efficiencies of 100 lumens per watt have been attained with high-power luminous arcs in the laboratory. Painstaking investigation of arc spectra of all known elements under various conditions of arc pressure and electrode temperature, may bring forth valuable results. Our present information, said the speaker, is confined chiefly to conditions of atmospheric pressure, yet the variety of color spectra to be obtained from any given electrode group is evident when it is recalled that the familiar red-less light of the mercury-vapor arc, undergoes radical changes from a predominating pinkish hue when superheated mercury vapor is used, to a violet color when the lamp is operated at very low temperatures and pressures.

Efficiencies approaching the theoretical limit of 300 to 400 lumens per watt are to be expected ultimately from the unexplored field of electro luminescence. Willemite, for example, under cathode bombardment exhibits a luminescence closely approaching the firefly's light, showing a broad band entirely in the visible range of the spectrum. Here, in this electro luminescence, the physicist has an energy conversion of the highest efficiency, as measured from input to output, but some efficient method of applying the exciting energy to the luminescent body remains to be discovered. It is, however, in these luminescence phenomena, as well as in the direction of the luminous arc—rather than in incandescent sources—said Dr. Steinmetz in closing, that future radical advances in efficiency may be expected.

Electric Lighting in Peace and War

An engaging and complete review of the recent history of the lighting art was offered in the elaborate sixty-page report of the committee on progress, presented by Dr. F. E. Cady, of Cleveland, Ohio. Refinements in manufacture, the work of standardization, rating of lamps, design of arc units, projection apparatus, automobile and searchlamps, signal lights, uses of lamps in war, adaptations of flood-lighting, street illumination, interior lighting, and photometric advances, were among the topics touched upon.

In connection with his paper on "Colored Glass in Illuminating Engineering," Dr. Henry P. Gage, Corning, N. Y., opened the Monday afternoon session with a series of spectroscopic lantern demonstrations of the properties of special glasses in controlling the transmission of visible, ultra-violet and infra-red wave-lengths. The fluorescence of certain glasses under ultraviolet radiation was also beautifully shown. Dr. Gage's paper contained some references to the processes of manufacture of the glass, and outlined many of the practical uses of the special glasses. He presented a number of spectroscopic diagrams and curves of transmission data. Dr. C. H. Sharp, M. Luckiesh, F. C. Caldwell and L. C. Porter spoke briefly in the discussion.

A plea for a dual system of electric and gas lighting in the average home as a protection against service outages, was made in the paper by C. H. French and C. J. Van Gieson, of Newark, N. J. The authors offered suggestions for gas and electric fixtures for various rooms, but described in general the use of present combination fixtures as being inartistic and inefficient.

Projection Problems

J. A. Orange, Schenectady, N. Y., in his paper on "Optic Projection as a Problem in Illumination," made a plea for the abandonment of the prevalent "point-

source" treatment of projection in searchlights and transparency projectors, in favor of the "source-surface" method. Following some observations on the principles of the searchlight, magic lantern, and moving-picture machine, the author discussed the bearing of lens-sizes and positions on the intensity and distribution of illumination at the screen.

In his paper on "Projection Engineering," R. B. Chillas, Cleveland, Ohio, proposed a method of increasing the efficiency of the projector arc by gathering up more of its rays through the medium of a comparatively large reflector, at the rear of the lantern. Such a 120-deg. ellipsoidal mirror would utilize 75 per cent of the light from the arc crater, of which barely 17 per cent is now available with the ordinary arc and lens equipment.

PHOTOMETRIC MEASUREMENTS

In his paper describing a new type of compensating screen for use with the integrating sphere in photometric measurements, Frank A. Benford, Schenectady, N. Y., pointed out that the theory of the integrating sphere, as usually given, assumes a certain uniformity of flux distribution that seldom exists in practice.

From a study of the factors that interfere with the application of the mathematics of the subject the author was led to adopt a petalled type of screen, doing away with the present individual screens for comparison and test lamps, and thus eliminating some of the principal sources of error. Illustrations of the new screen with its opaque petals clear sections just sufficient to increase the total transmission from 89 to 111.

LAMP TESTS AND INSPECTION

In a paper on "Forced Life Tests of Incandescent Lamps," Leonard J. Lewinson, New York City, discussed the purpose of life tests in general and the objects attained, emphasizing the cost and the length of time required for completion of normal tests. The method of overcoming these difficulties by means of forced tests and the proper interpretation of the significance of such forced tests to manufacturers, consumers, engineers, inventors, etc., were set forth. The methods of making forced tests were described, and the necessity for ideal conditions was pointed out. The second part of the paper discussed the form of correction curves and referred to the precautions necessary in the use of curves and factors.

An interesting application of the mathematical theory of probability to the inspection of manufactured articles was presented in the Tuesday morning paper by W. G. Houskeeper, New York City. Having selected representative samples of such articles, and having made careful measurements of a dimension of each sample, the author showed a simple and quick method of calculating the percentage of the total product which will probably lie between any two limits which may be placed upon the particular dimension under observation.

GUESTS AND DELEGATES AT BANQUET OF ILLUMINATING ENGINEERING SOCIETY

BRIGHTNESS AND VISION

"Apparent Brightness; Its Conditions and Properties," the paper by L. T. Troland, Cleveland, Ohio treated the subject of brightness from the psychological and physiological points of view. Visual response was analyzed into successive stages, and the relations of apparent brightness with the "intensity factors" of these stages were considered. The measurement of the retinal image, the laws of variation of the sensitivity and selectivity of the retina for brightness, the Purkinje effect and intensity factors in the optic nerve conduction were all analyzed. It was shown that brightness sensitivity as expressed by the ordinary "visibility curve" rests upon

a single physiological process, independent of the mechanism of color perception.

Dr. P. G. Nutting's paper on "Brightness and Contrast in Vision," which followed that by Dr. Troland, outlined the relations between lighting and good seeing which center upon the psycho-physical laws relating perception to the flux density of light at the retina, all other relations between lighting and seeing being simple physical and geometrical optics. Of chief interest at every brightness level are (1) the lowest perceptible brightness, (2) the faintest perceptible contrast, and (3) the highest comfortable brightness. Precise data on threshold, contrast and glare sensibility were given over the whole visual range. A new quantity, the "discrimination factor," which became a direct measure of seeing quality, was defined by Dr. Nutting.

The papers by Drs. Troland and Nutting were discussed jointly by Dr. E. P. Hyde, Dr. C. E. Ferree, M. Luckiesh, Ward Harrison, F. C. Caldwell, and J. R. Cravath.

Prof. F. C. Caldwell of Ohio State University, Columbus, Ohio, next reported the results of some tests to determine the effect of brightness of light source on the subject's impression of the general illumination existing.

Reflectors of Different Densities

Some experiments on the eye with pendant reflectors of different densities were reported by Dr. C. E. Ferree and Miss G. Rand of Bryn Mawr, Pa., following along the line of the work of the authors in previous papers when the gradation of surface brightness and its distribution in the field of vision were shown to be important factors in the effect of lighting conditions on the eye. In the work of the authors' last paper gradation of surface brightness was made the chief variable. Inverted reflectors of six different degrees of density were employed and a correlation was made between the illuminating effects obtained and the tendency to cause loss of power to sustain clear seeing and to produce ocular discomfort. In the work of the present paper these reflectors, with one omission because of close similarity in the series, were installed pendant.

Bowls and Reflectors

"Recent Developments in Prismatic Glassware" were recounted by Howard W. Jenkins and George W. Roosa, Newark, Ohio, in the paper read by Mr. Jenkins at the opening of the Wednesday morning session. Although the great brightness of the gas-filled lamp has introduced a factor of glare, this can be compensated for by a diffusing medium which, the authors pointed out, is secured in prismatic reflectors by the use of a highly developed etching process.

In the discussion, Ward Harrison, Cleveland, Ohio, commented on the usefulness of the new semi-indirect decorative bowl in securing proper distribution of light in the low-ceilinged rooms of dwellings. R. F. Pierce, Philadelphia, characterized the new decorative bowl as a very important development, for much, he pointed out, depends upon evenness of illumination in obtaining proper esthetic effects.

In their paper "Reflectors for Glass Bowls," J. L. Stair and J. A. Hoeveler, Chicago, pointed out that many glass bowls which have artistic merit do not conform to best practice, and vice versa. Therefore, if by some means it is possible to make every glass bowl conform to good illuminating practice, those who are discriminating in the choice of lighting equipment, have at their disposal all of the many designs and types of glass bowls now available. The authors described means of accomplishing these results by the use of auxiliary reflectors within the glass bowls, providing efficient distribution of light upon the ceiling diffusing surface, and also lighting up the bowl itself in an attractive manner. A number of bowl and reflector designs were illustrated, and data and curves were presented to show the characteristics of each.

W. R. Moulton, Baltimore, Md., Norman Macbeth, New York City, J. R. Cravath, Chicago, S. G. Hibben, Pittsburgh, Pa., and Dr. C. P. Steinmetz, spoke in the discussion.

Lighting of Cleveland Art Galleries

Dr. E. P. Hyde, Cleveland, Ohio, exhibited a number of lantern slides showing the lighting of the new Cleveland Museum of Art, the design of which was in charge of a subcommittee consisting of Evan J. Edwards, Ward Harrison, and M. Luckiesh. A number of special features were introduced in this building, a detailed description of the equipment of which was given in his printed paper.

Economics of Office Building Lighting

Samuel G. Hibben, Pittsburgh, Pa., closed the technical program with an account of "Study of the Economics of Office-Building Lighting," special consideration being given to the wiring, fixtures, upkeep and other details of service. The rental value of offices as affected by natural and artificial illumination was dealt with and a number of curves and charts were included showing the effects of different types of shades, of different hanging heights, etc., on the intensity of illumination. The costs of several sample installations were compared from the standpoint of economy in installation and operating costs.

President-Elect Serrill Proposes I. E. S. Correspondence Courses

Following the report of the committee on the president's address, presented by Prof. G. A. Hoadley, Swarthmore, Pa., and that of the committee on resolutions, J. R. Cravath, Chicago, chairman, President Steinmetz called to the chair his successor in office, William J. Serrill, of the United Gas Improvement Company, Philadelphia.

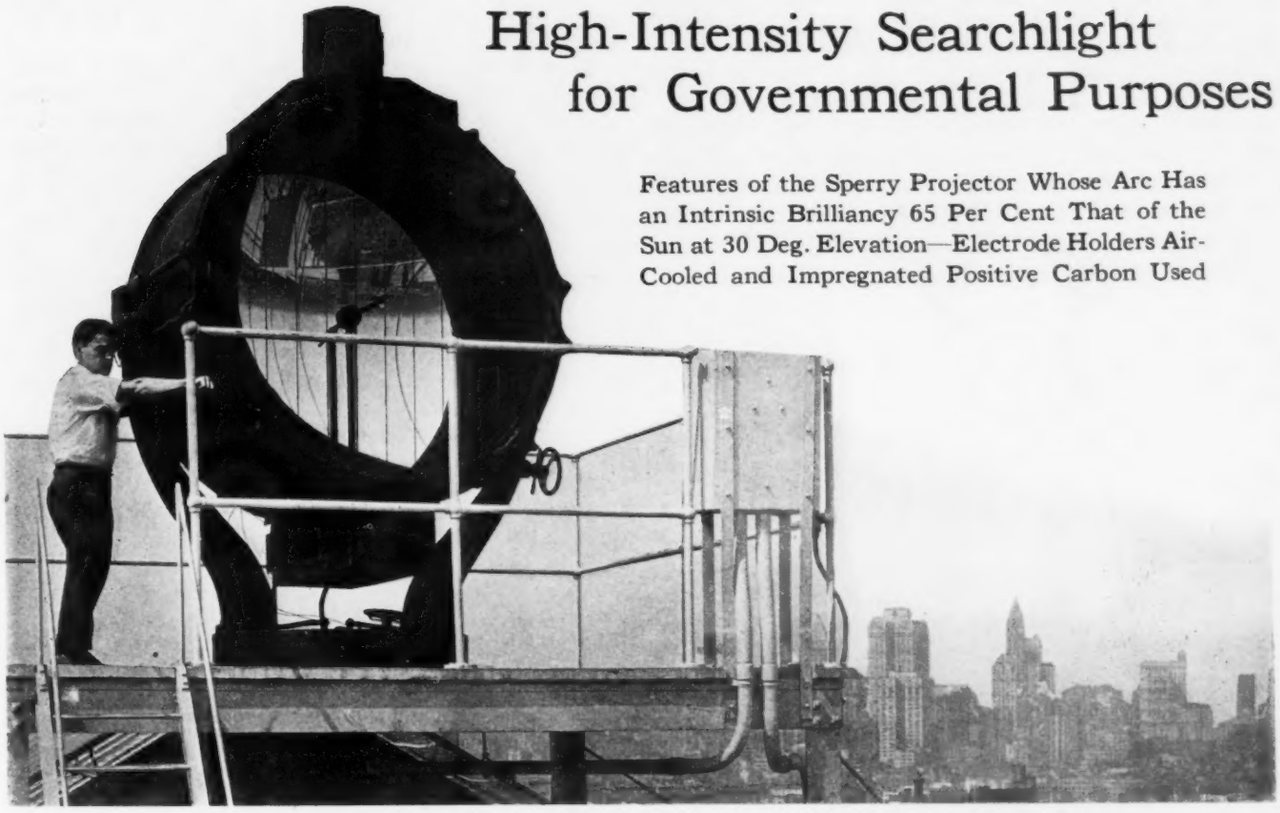
President-Elect Serrill in a brief talk, outlined the various aims held up before the Illuminating Engineering Society and touched particularly on the problem of making the work of the organization of more direct value to its non-professional and non-scientific members—particularly the lighting salesmen, fixture makers and dealers, and contractors on whose membership it depends for support and strength. Mr. Serrill proposed that for these members a correspondence course in the principles of illuminating engineering be instituted, obtainable only through I. E. S. membership, and he predicted that such a course would be of the greatest value not only in winning new members but in improving the design of lighting installations the country over.

Entertainment Program

A delightful entertainment program for both ladies and men delegates was arranged by the Philadelphia general committee, of which Joseph D. Israel was chairman. A feature of the reception and dance held in the hotel ballroom on Monday evening was a rendition of "color music," colored-light accompaniments being furnished for the pianist's mood. On Tuesday the tenth annual banquet was given in the Rose Room of the Bellevue-Stratford. President Steinmetz, in a witty address, introduced E. B. Cattell as toastmaster, and short speeches were delivered by J. B. McCall, William H. Gartley, past-president, and William J. Serrill, the president-elect of the society.

High-Intensity Searchlight for Governmental Purposes

Features of the Sperry Projector Whose Arc Has an Intrinsic Brilliancy 65 Per Cent That of the Sun at 30 Deg. Elevation—Electrode Holders Air-Cooled and Impregnated Positive Carbon Used



ACCORDING to tests by the United States Navy, published two years ago in the July 25 issue of the ELECTRICAL WORLD, the Beck searchlight was shown to be the highest-powered projecting lamp in the world. It employed small electrodes which were worked at a very high current density. For 150-amp. lamps the positive and negative electrodes were respectively 16 mm. (0.5 in.) and 11 mm. (7/16 in.) in diameter. To maintain a small positive crater and thus confine the light-giving source to a small area the electrodes were cooled by alcohol vapor. The positive electrode was allowed to consume at the rate of about 200 mm. (7⅞ in) to 250 mm. (9⅞ in.) per hour.

Experiments are now being conducted on the roof of the Sperry Building, Brooklyn, N. Y., with a new high-intensity searchlight lamp which bids fair to eclipse the German lamp. About the same diameter electrodes are used but the arc crater is more confined. The electrode holders are cooled by air and the positive electrode is allowed to consume more rapidly than the Beck lamp. According to Capt. Adelino Gibson, Coast Artillery Corps, U. S. A., the Sperry lamp is much more powerful than any of the present standard army and navy searchlights. From other reports, the lamp projects a beam of light that has been seen 50 miles from the searchlamp. In further tests attempts will be made to transmit light signals by means of this lamp to Philadelphia, a distance of about 91 miles.

Aside from its remarkable beam intensity, the searchlamp has a number of constructional and operating features. Instead of producing the light with the positive crater of a pure carbon arc, impregnated carbon is used and worked at such a high temperature that a superheated vapor or gas is maintained in the crater, thus giving a much higher intrinsic brilliancy than is usually obtained. In order to develop the most light from the superheated vapor, a very deep and small diameter crater is maintained in the positive electrode and the vapor compressed in it by the flame from the negative electrode. With this arrangement, the crater is made to emit more than 500 cp. per square millimeter or 320,000 cp. per square inch. This is 65 per cent of the intrinsic brilliancy of the sun at 30 deg. elevation and almost three and one-half times the brilliancy of a pure carbon arc crater.

Another great advantage of the lamp is that the area of the light giving source or crater has been considerably reduced. By thus closely approaching a point

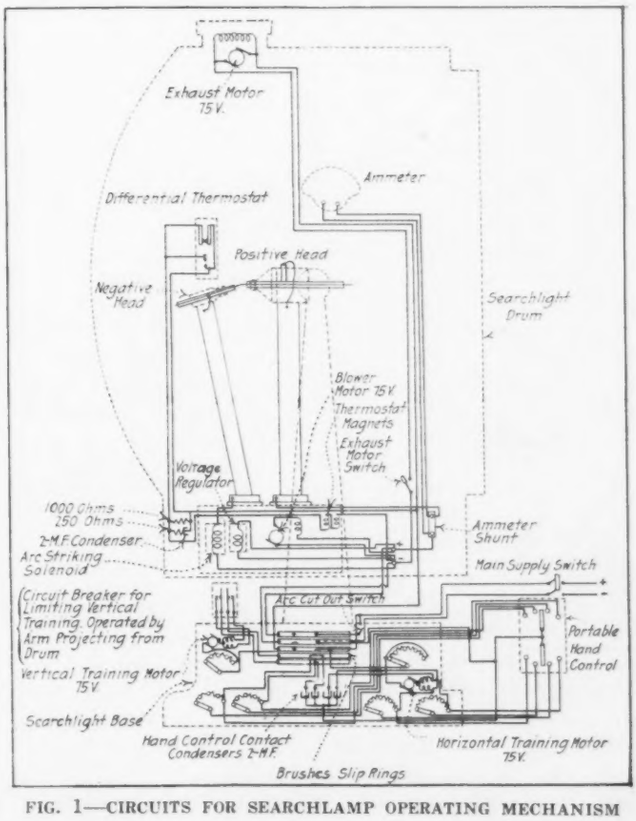


FIG. 1—CIRCUITS FOR SEARCHLAMP OPERATING MECHANISM

source of light, the reflector can be utilized to better advantage and the rays projected more nearly parallel. For the 150-amp. lamps, the diameters of the positive and negative electrodes are respectively 5/8 in. and 7/16 in., about the same as for the German lamp. The positive and negative electrodes of the 200-amp. lamps are about 2 mm. and 1.5 mm. larger respectively. On account of the small size of the negative electrode and its holder, very little shadow is cast on the mirror, thus increasing the beam intensity.

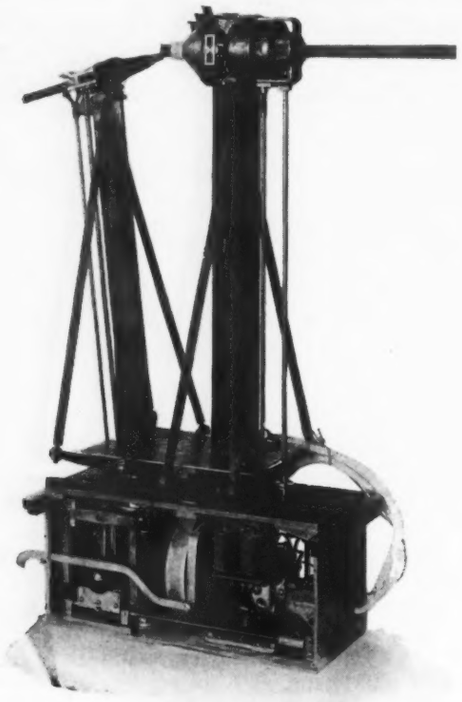


FIG. 2—MECHANISM FOR FEEDING AND COOLING ELECTRODES

A rate of consumption of the positive electrodes is selected, which favors the production of the correct amount of gas required in the positive crater to insure the high intrinsic brilliancy. The positive carbons are made much longer, being 36 in. for a 150-amp. arc. From tests with this high-intensity arc, it has been observed that the current, not the current density, is the controlling factor in producing the best results. The 60-in. lamp takes about 200-amp. at 70 volts and the 36-in. lamps require about 150 amp. The rate of consumption of the positive electrode is in the neighborhood of 13.5 in. per hour. The beam intensity of the 60-in. lamp at ½ mile is estimated to be about 85 ft. candles and that of the 36-in. lamp about 30 ft. candles. Accurate data on this subject is not available, however, at present. The light source is so diminutive that the 60-in. lamp beam has only one degree of dispersion according to measurements that have been made.

The electrode holders and mechanism for maintaining the arc in the desired position in the reflector are illustrated in Fig. 2. Instead of cooling the electrodes as is done with the Beck alcohol-cooled arc and thereby naturally reducing the efficiency, every precaution is taken to maintain the highest possible temperature of the positive electrode tip and thin crater walls since the illumination varies as a large exponential factor of the temperature. The electrode holders are cooled by intensive methods, however. This is performed by forcing air up through the electrode supports, which are hollow. The air supplied to the positive holder is discharged between heat-radiating disks which surround the holder. This arrangement cools the mechanism feeding the electrode and insures its continuous operation. Air pressure is supplied by a motor-driven centrifugal blower in the base of the lamp.

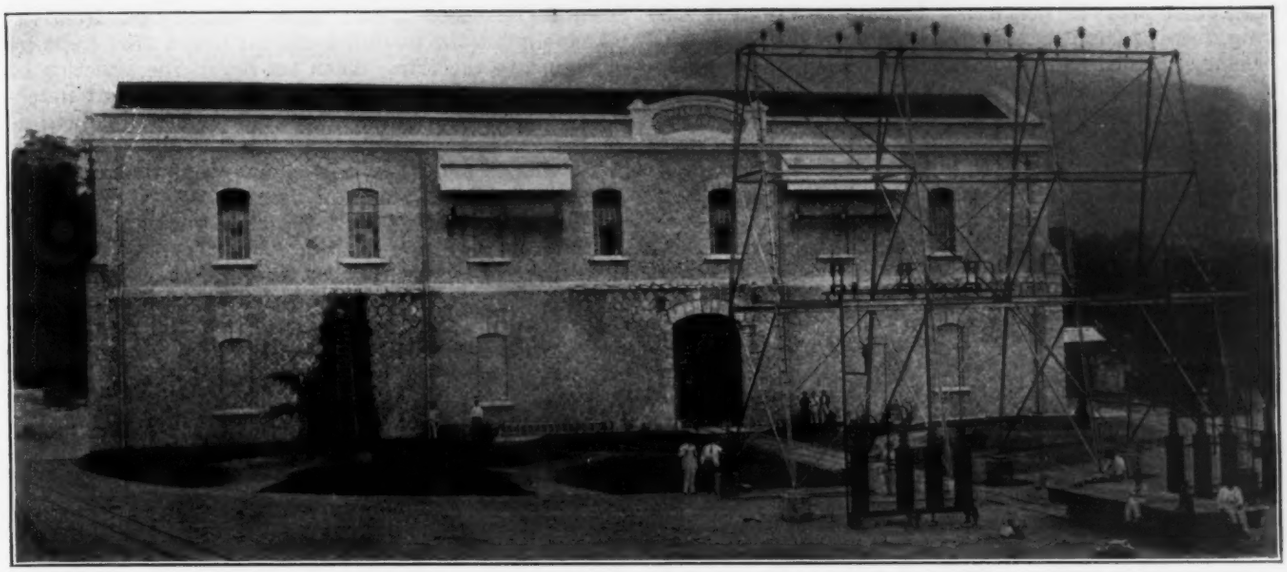
With so small a source of light emanation as is employed in this lamp, it is necessary that two operating conditions be assured: First, is the maintenance of a perfectly symmetrical source. This is secured by continuously revolving the positive electrode. The blower motor is used for this purpose, being connected to the positive electrode holder by a shaft and gear trains. Second, this highly concentrated and localized light source must be maintained with a high degree of precision, at the exact focal point of the mirror. This is accomplished by means of a differential thermostat which has been found by government officers, during a ten-hour run, to maintain the arc within 1.5 mm. of its proper location in the exact focus limit.

The differential thermostat is attached to one side of the searchlight drum diametrically opposite the focal point of the lamp reflector and also opposite a small convex mirror on the other side of the drum. When the arc crater is in its proper position light is concentrated by the small mirror on the thermostat. As soon as the arc burns out of the normal position, however, the thermostat causes a solenoid to advance the electrode until the light is concentrated, on the thermostat when the crater is again at the focal point.

Connected with the motor driving the blower and feeding and rotating the positive electrode is the horizontal rod shown at the bottom of the lamp mechanism. This in connection with the large solenoid connected directly across the arc causes the negative electrode to be drawn back or fed forward depending on the arc voltage. Another solenoid, not visible in the illustration, imparts to the negative electrode the striking motion required to establish an arc.

FIG. 3—A 36-IN. SEARCHLAMP AND TRAINING CONTROLLER

Four sizes of this lamp are now available—the 24 in.; 30 in.; 36 in.; and 60 in. The lamps are made by the Sperry Gyroscope Company, Manhattan Bridge Plaza, Brooklyn, and Elmer A. Sperry, member of the Naval Advisory Board, is the inventor of the system.



ELECTRICAL manufacturers need to develop export trade because it will create a demand for their products which will help to keep their plants busy when domestic consumption declines. The large manufacturers understand the advantages of foreign trade as a steadying influence in their operations, but as a rule the smaller manufacturers have not begun to investigate its possibilities. Foreign consumers show by their attitude that they welcome our trade. Opportunity therefore encourages electrical manufacturers to prepare to market their products in overseas markets.—E. M. Herr, president American Manufacturers' Export Association and president Westinghouse Electric & Manufacturing Company.

Promoting the Electrical Export Business

International Conditions Invite the American Electrical Manufacturer to Prepare for Larger Foreign Trade—Constructive Steps Are Under Way

AN electrical manufacturer who was asked why he did not investigate the possibilities of export trade replied that his plant was operating at capacity. he had a large volume of unfilled orders on hand, and he had never had any experience in foreign business anyway.

Unfortunately the electrical manufacturing business, like many other industries, is subject to sharp fluctuations with the current of general business. It responds quickly to an increase in the volume of general trade and manufacturing activity. But lessened activity in industry at large has an adverse effect which is felt just as sharply by electrical manufacturers.

Foreign trade is a stabilizing influence which will justify greater uniformity in production from year to year, and particularly will prevent serious declines in business during periods of domestic depression. Times of depression in local business are seldom coincident with depression in the other countries which will be the natural customers of American electrical manufacturers.

The effect of development will be felt not only by the manufacturing company, that is to say, by the owners of the property, it will also contribute materially to the reduction of the labor problem.

LEVELING THE PRODUCTION CURVE

In short, foreign trade will fill up the valley in the production curve of the electrical manufacturer.

Most of the export business among the electrical manufacturers in this country is done by the well-known larger companies. Although there are conspicuous exceptions to this statement, the greater companies have expended large sums of money in the development of foreign selling organizations which have carried their products into the world markets.

Interest in foreign trade possibilities for electrical manufacturers is greater than it has ever been before in the history of the industry. This is not because the manufacturers expect immediate orders in overwhelming volume, but because they are looking far ahead to the probabilities of future years. Just at present the enormous domestic demand, to which an unusual volume of export business has been added, is testing plant capacity in all branches of the industry.

There are several reasons why the minds of the manufacturers, in planning ahead, turn to export markets. It is inevitable that these should be associated with the terrible European war. It is recognized clearly that the channels of world trade will not be the same after the war that they were before. Just what results will flow from economic alliances and from realignments of friendly and hostile nations, cannot be foretold, but some countries will lose business in one quarter and gain in another, and in the "rough play of economic forces" the United States will have to take its chances with the rest.

In the last two years the electrical manufacturers of this country have had avenues opened to them for their goods that were not inviting before. These are not only in neutral countries; belligerent nations and colonies which have not bought in this country in other years have come here seeking goods.

WORK OF THE FEDERAL GOVERNMENT

The national government has made unprecedented efforts to promote the interest of electrical manufacturers, in common with manufacturers generally, in export markets. The Department of Commerce has sent several representatives to foreign lands on special missions to investigate the openings for the products of American electrical manufacturers. One of the most important missions of this nature is the one on which R. A. Lundquist is to start next month. He is an electrical engineer from Minneapolis, and he will be absent from one to two years in the Far East.

Another way in which the federal government has sought to promote export trade by means which will benefit electrical manufacturers is through its advocacy of export associations. Such associations are common in Europe. They represent a virtual combination of manufacturers for export trade. The Webb bill was introduced in Congress to give legality to the ideas of the Federal Trade Commission, President Wilson and others who approved such a movement, but, unfortunately, this measure failed of passage at the last session. However, so generally is the movement favored that it is believed that with fair consideration of the measure Congress will pass it.

The Associations Give Aid

While associations of manufacturers do not regard themselves as free under the present law to do what European associations do, they are accomplishing much that furthers the interest of their members in this direction. The Associated Manufacturers of Electrical Supplies, complying with a request from the Federal Trade Commission, wrote to its members to ascertain how many of them were interested in foreign trade and had favorable replies from 85 per cent.

As this association is new, it has not yet undertaken all of the activities which its officials have in mind for it, but the expectation is that at the next meeting of the board of governors an export committee, or some committee to devote special attention to that subject, will be formed. Other associations, not confined wholly to the electrical industry, are doing much to increase the interest of manufacturers generally in the subject.

The American Manufacturers' Export Association, of which E. M. Herr is the president, has undertaken a constructive commercial mission in sending a commission to France. Among the members of this commission, whose return is scheduled for October, are Dr. C. O. Mailloux, past-president of the American Institute of Electrical Engineers; W. W. Nichols, assistant to the chairman of the Allis-Chalmers Manufacturing Company, and James E. Sague, former member of the New York Public Service Commission, Second District.

Commission Goes to France

"The trip which the American commission, organized and sent abroad by the American Manufacturers' Export Association, is making to France developed naturally from the journey which was made to this country during the last winter by a French commission," said Mr. Herr to the representative of the Electrical World. "In coming here the French commission had the definite object of finding out what this country can do in the way of furnishing materials to aid in the work of reconstruction after the war. It was not a buying commission, it was more like a diplomatic trade commission, seeking to study the possibilities in our output of raw materials and manufactured articles which will be most needed in order not only to re-establish the devastated sections of France for industrial activity, but also properly to equip all other parts of industrial France to enable her to best meet the changed conditions after this great struggle.

"At a luncheon given to the French commission by the American Manufacturers' Export Association I referred wholly in an incidental way to the fact that it would be a fine courtesy for American business men to return the trip of the French commission. The suggestion was taken up with so much enthusiasm and with so cordial an invitation by the members of the French commission that we set immediately about the preliminary work necessary in so important a matter. First, we found from the Department of State and from Ambassador Jusserand of France that from the standpoint of the governments concerned there was no objection to the trip. Then we began the selection of individuals representing the different classes of industries most concerned in the results of such an investigation.

"It will be understood, of course, that the American commission which is now in France is not in any sense a selling organization. It is really making an engineering study of the facts.

"Some people say that it was useless to have sent a commission to France while the war is still in progress. The answer to that is: First, the trip of the commission was greatly desired by the French; second, no one can tell when the war will be concluded, and it might be ended suddenly, and, third, if we had waited until peace is declared it would mean so much delay to organize a commission and arrange for its tour that by the time it would reach France it would be too late to accomplish anything.

French Seek Our Goods

"The French people were most anxious that the American commission should visit its cities and industrial centers now in order to study the needs that will confront them when they again begin to re-establish themselves industrially. In this country we are always seeking the buyer. The French came to us to see what goods we can sell them, and yet so unaccustomed are American business men to trading with foreigners that it was even difficult to get the commission together. Before the war the Franch were noted for their skillful handwork. Now they realize that with many maimed men they will have to develop skill in machine work, and they are foresightedly looking to us to furnish the machines.

"While the members of the French commission were here they made it plain that they regarded it as desirable, even while the war is still going on, to form the new industrial connections which they feel they would like to have in this country. The most elaborate preparations were made for the tour of the American commission in France. A number of cities are being visited, and it is believed that careful estimates can be made of the needs of these centers which America can supply, and possibly in some instances the quantities of machines and apparatus which will be bought after the termination of the war.

"Expenses of the commission are being met by some of the larger manufacturers in the association, but the information obtained by the commission will be given not only to our members, but also as far as practicable to the country at large so as to assure the utmost possible benefit in the new exchange of trade between the two countries."

Although, because of the trip of this commission, France stands conspicuously at present as a customer of the future, the trip of the Latin-American commission to South America, the evident interest of Latin America as a whole in future trade relations with this country, the inviting attitude of Russia and the cordial feeling of other countries are factors which point to new international commercial connections.

This is the first of a series of articles in which the Electrical World *will take up different phases of export trade. The articles will deal with questions of larger principles and with the ways and means of developing overseas markets. They will appear in the commercial issues, that is to say, in the fourth issues of consecutive months.*

Industrial Electric Heating Seen in Its Ascendancy

Epoch of Rapid Advancement Is Near in This Branch of the Business—E. W. Lloyd Advises Central Stations to Capitalize Its Development—Results of Electric Heating Campaign in Chicago

BY some central station executives and sales engineers it has been supposed that only companies numbering among their customers great automobile plants can acquire industrial electric heating loads of any magnitude. Perhaps the stupendous growth of the electric enameling business in two American cities has in a measure created this impression. Such great developments seem to have obscured the smaller but quite important electric heating applications which exist almost everywhere.

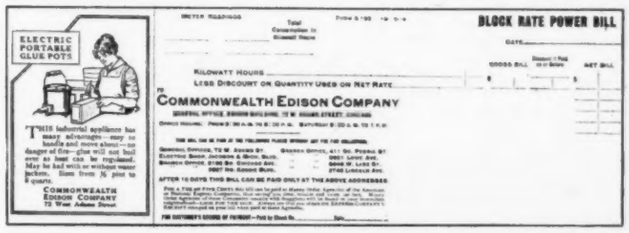
Certain students of the industry—engineers who view the field as a whole—have been quick to realize, however, that rich potentialities for heating business exist in almost every local field, and these men freely urge that central stations develop the latent heating load within reach of their present lines.

Early in the history of industrial electric heating the Commonwealth Edison Company of Chicago was conducting studies in the industrial electric heating field in its territory, and replying to an inquiry in regard to the general situation as it has developed in the Chicago field, E. W. Lloyd, general contract agent for the company, said:

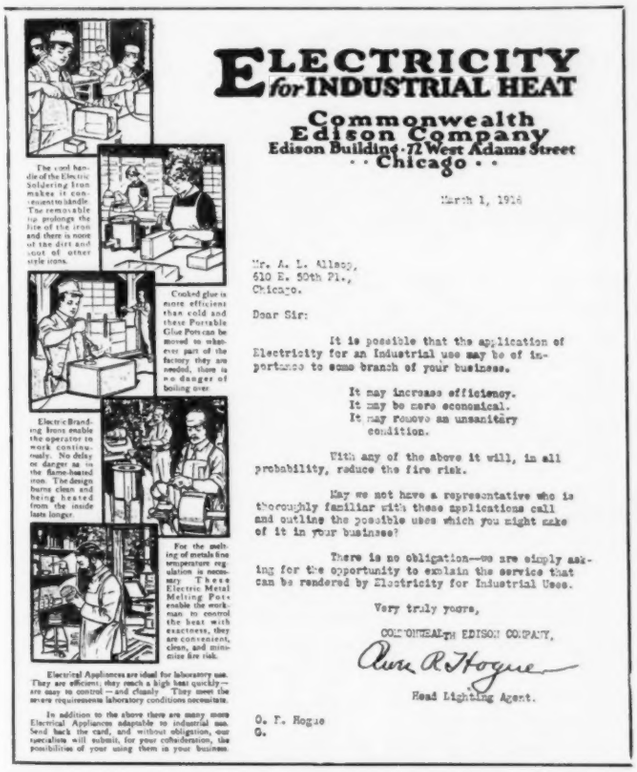
"Progress, since the company began investigating the possibilities of the industrial heating appliance business about six years ago, has been slow. At present, however, the acceleration of that branch of the electrical business is much greater than it has ever been before. To me the various branches of the business seem to move in epochs. Certain applications of electrical energy or certain devices, when new, will move slowly for a long period. Then a time will arrive when they will advance by mammoth strides. The history of the electric-iron market, the toaster market and the percolator market shows this tendency. I believe the industrial electric heating business is on the threshold of another such rapid acceleration period.

DEVELOP LOCAL HEATING POSSIBILITIES

"The chief factors which have made rapid development possible are the general reductions in electricity rates, and the inherent advantages of electricity for


ELECTRIC PORTABLE GLUE POTS
COMMONWEALTH EDISON COMPANY
72 West Adams Street
BLOCK RATE POWER BILL
KILOWATT HOURS
LESS DISCOUNT OR QUANTITY USES ON NET RATE
COMMONWEALTH EDISON COMPANY

POWER BILL, ON WHICH APPLIANCES ARE ADVERTISED


ELECTRICITY for INDUSTRIAL HEAT
Commonwealth Edison Company
Edison Building · 72 West Adams Street
· · Chicago · ·
March 1, 1916
Mr. A. L. Allsop,
610 E. 50th Pl.,
Chicago.
Dear Sir:
It is possible that the application of Electricity for an Industrial use may be of importance to some branch of your business.
It may increase efficiency.
It may be more economical.
It may remove an unsanitary condition.
With any of the above it will, in all probability, reduce the fire risk.
May we not have a representative who is thoroughly familiar with these applications call and outline the possible uses which you might make of it in your business?
There is no obligation—we are simply asking for the opportunity to explain the service that can be rendered by Electricity for Industrial Uses.
Very truly yours,
COMMONWEALTH EDISON COMPANY,
Head Lighting Agent.
O. P. Hogue
O.

CIRCULAR LETTER SUGGESTING APPLICATIONS OF ELECTRICITY FOR INDUSTRIAL PURPOSES

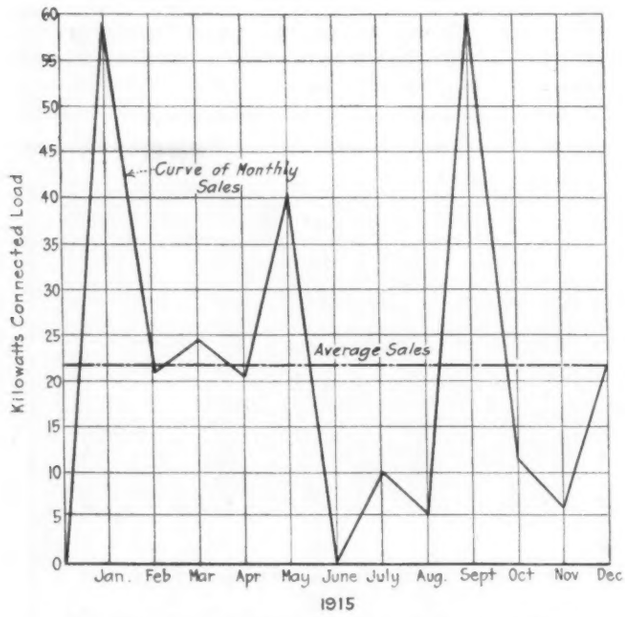
Do It Electrically
If you are not using Electricity for Industrial Heating we would like to show you how well we can do it Electrically. In nearly every case it will be found that Electricity will do the work better, increase efficiency and improve working conditions.
Because "it has never been done" Electrically is no reason why we cannot "do it." The more difficult it appears to accomplish the more satisfaction it is to us after we have effectuated it. The following are a few of the specialties which we have installed:
Annealing Ovens
Bread Baking Ovens
Core Baking Ovens
Chemical Drying Ovens
Drying Ovens
Enameling Ovens
Japanning Ovens
Tempering Ovens
Our corps of heating specialists are at your service at all times and we particularly ask that you consult them freely. If you have not already done so, mail the return card which we recently sent you and let one of our experts go over your problem in detail with you.
COMMONWEALTH EDISON COMPANY
Heating and Appliance Division
EDISON BUILDING CHICAGO 72 WEST ADAMS STREET

CARD THAT FOLLOWS CIRCULAR LETTER TO EMPHASIZE POSSIBLE INDUSTRIAL USES OF ELECTRICITY

industrial heating. The establishment of proper rates has led and will continue to lead to experiments from which industrial plant operators will gain experience with electric heating. They will learn how to make it work. No big difficulties from an engineering standpoint bar the way, but it will be necessary to work out the 'little bugs' in the different applications.

"So it seems to me that now is the time for central stations to take stock of their industrial fields and, if possibilities of industrial heating are there, to put some capital into the development of that business. The things which have forced the rapid adoption of electricity for heating in Toledo and Detroit—namely, demand for rapid production, for a better and more uniform product, for economy in operation and for reduction of fire hazard—will operate in a more gradual manner to bring electric heating to other cities.

"It is quite true that local conditions will guide local developments. The rapid strides of the automobile industry were responsible for the addition of enameling oven loads in Detroit and Toledo. In Chicago, on the other hand, I expect to see the electric furnace one of the greatest heating load builders, because Chicago is admittedly the best scrap metal market in the United States, and the electric furnace is particularly well



CONNECTED LOAD REPRESENTED BY MONTHLY SALES

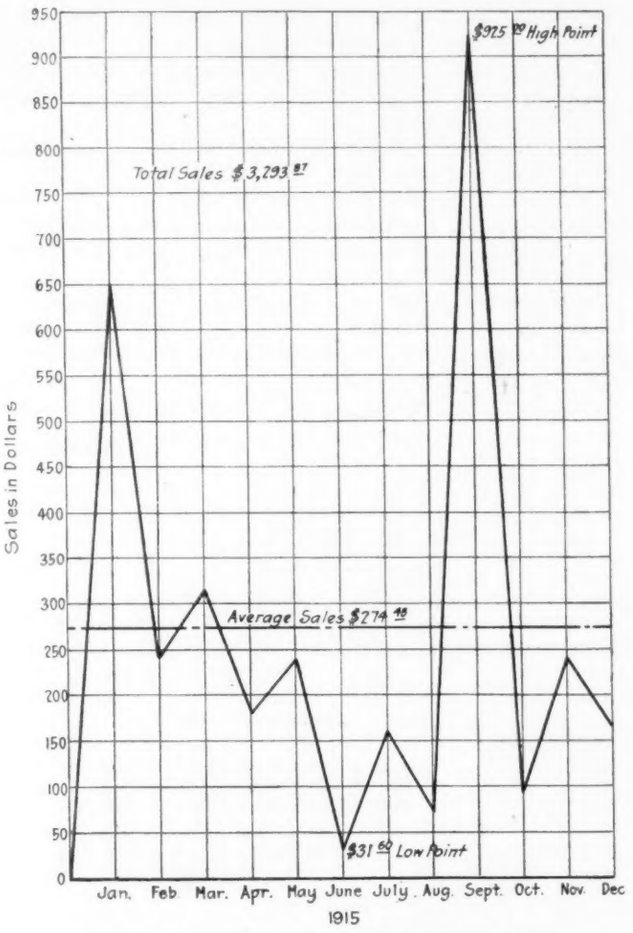
fitted for refining scrap metal. But aside from ovens and furnaces the many smaller applications must not be overlooked. For this reason the central stations, which have industrial electric heating prospects of any sort, should put some capital—money and brains as well—into that business.

Industrial Engineers Required

"Men should be hired to attack this branch of the business and they should not be expected immediately to add several thousand kilowatts of electric heating to the station. They must work out the engineering problems first. The need for such men is evidenced by the increasing frequency with which power customers are asking us to solve heating problems for them electrically. Only recently we were called upon to design, construct, install and guarantee an electrified pole-treating tank. We undertook the task guaranteeing not only the satisfactory operation of the tank but also the limit of the cost of operation. I repeat, therefore, that to get industrial electric heating load the services of industrial engineers, backed by the courage it takes to strike out into an unexplored field, are necessary."

How Chicago's Electric Heating Campaign is Conducted

That the Commonwealth Edison Company is itself following the course recommended by Mr. Lloyd appears in its own aggressive industrial heating campaign. Under the supervision of the heating and appliance division, of which O. R. Hogue is head, the services of one industrial engineer are constantly employed in this work alone. Moreover, about $500 was spent in publicity work for this branch of the business


Sales in Dollars
$975.00 High Point
Total Sales $3,293.87
Average Sales $274.49
$31.50 Low Point
Jan. Feb Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec
1915

AVERAGE AND TOTAL VALUES OF MONTHLY SALES

last year. Recently another industrial engineer was added to the staff. Of course, these two men alone cannot cover the entire city so power engineers, and appliance and lighting salesmen help solicit this class of business, assisted when necessary by the industrial heating engineers.

The publicity work this year consisted of direct-by-mail advertising of three sorts; namely, special circulars on electric heating, mimeographed letters on industrial heating letterheads, and advertisements on power bills. At regular bi-monthly intervals a picked list of 3500 manufacturers received this literature. Return postcards were always inclosed. The replies increased with each circularization. It was also noticed early in the campaign that only devices specifically described in the advertising were mentioned in the inquiries. If the advertising mentioned glue pots, customers asked only for glue pots. If the advertising told of branding irons practically all inquiries were for branding irons. As the result of this observation the later circulars listed as many electric heating appli-

INDUSTRIAL HEATING APPLIANCES IN CHICAGO

Device	Number	Kilowatts
Air heaters (industrial)	40	46
Baking installations	10	127
Bacteriological ovens	7	6
Branding irons	80	28
Beer-vat dryers	11	33
Can cappers	105	36
Commercial flatirons	25,000	17,000
Coffee urns (commercial)	9	14
Disk stoves (industrial)	700	385
Drying ovens	7	18
Embossing presses	11	17
Extract heaters	70	139
Furnaces (resistance)	18	38
Film dryers	13	27
Enameling ovens	5	603
Furnaces (arc)	4	2,680
Glue pots	5,000	1,150
Glue cookers	15	72
Glue heating installations (special)	54	37
Immersion coils (liquid heating)	150	170
Ink dryers	160	96
Linotype pots	21	36
Liquid heating installations (special)	65	72
Metal melting pots	5	11
Material heaters	36	57
Monotype pots	2	4
Printing press dryers	7	11
Putty warming machines	5	9
Pleating machines	6	7
Photo print dryers	4	8
Pyrographic machines	5	29
Photo chemical bath heaters	7	13
Popcorn machines	14	35
Roofing machine heaters	4	29
Radiant heaters (industrial)	240	144
Sealing wax heaters	200	40
Sterilizers	90	40
Soldering irons	750	150
Soldering iron furnaces	30	18
Solder pots	9	5
Tempering ovens	2	9
Tempering baths	1	7
Toasters (commercial type)	27	82
Vulcanizers (industrial)	18	14
Varnish heaters (spraying)	175	105
Wax knife heaters	34	9
Wax heaters	32	7
Waffle irons (commercial type)	12	12
Total	33,270	23,857

cations as practicable on the space allotted. A general survey of the inquiries indicated that electric heating publicity to be effective must give specific information; and that the lack of knowledge of the possibilities of electric heating can be overcome only by consistent advertising.

RESULTS OF ADVERTISING

As an example of the advertising results obtained the following is cited: The first advertisement, a folder, brought nine immediate sales amounting to 12 kw. and disclosed seventeen live prospective customers with 104 kw. heating load. The second advertisement, a letter on a special letterhead, assisted in selling fifteen devices with 19 kw. load and brought to light forty-two prospects with an aggregate load of 305 kw. Another folder with a follow-up card made nine sales totaling 33 kw. and uncovered prospective new business for 168 devices totaling 482 kw. Three sets of flyers on power bills, describing glue pots, soldering irons and branding irons, resulted in sixteen sales and 171 prospects.

In the incidents cited the term "sales" is used to indicate immediate sales, not the total sales following the circularization. As the result of advertising the glue pots and soldering irons moved most actively. In all this advertising it was observed that while the percentage of inquiries to circulars is not large the percentage of ultimate sales to inquiries was nearly 95 per cent—a strikingly high figure.

As a guide in selecting advertising appeals in the future, a canvass was made of 100 electric heating customers selected at random. They were asked why they selected electric heat in their shops. Eighty per cent answered, "For safety reasons," that is, to reduce fire hazard or to eliminate explosion risks. Ten per cent replied that the electric way had solved some hitherto impossible problem such as increasing an already-forced production. Another 10 per cent said electric heat was chosen to bring about better working conditions for employees. Consequently it is thought that the safety appeal is one of uncommon strength.

INVENTORY OF ELECTRIC HEATING APPLIANCES AND CONNECTED LOAD IN CHICAGO

In the midst of all this work to secure new electric heating business the company found time to take an inventory of its existing industrial heating customers. This record, which is correct as of July 1, is given herewith, partly to show the wide variety of applications and partly to point out the attractiveness of the industrial electric heating load.

As this table shows, the total number of devices connected is 33,270. They produce a connected load of 23,857 kw. It has been estimated that the first cost of all these devices was about $325,000. While by far the majority of the devices sold have been irons and glue pots—the more perfectly developed devices—variety in application is beginning to be noticeable. It is, in fact, the appearance of this evident variety of uses which has bred the enthusiastic optimism in the Chicago central station field.

ELECTRIC REFRIGERATOR FOR INDOOR ICE RINK

Space Economy Afforded by Electric Drive of Refrigerating Equipment—Arrangement of Freezing Coils and Equipment

In the Washington Heights district of New York City there has recently been opened an indoor ice skating rink, the refrigeration for which is furnished by motor-driven apparatus. Illumination is furnished by gas-filled lamps. The rink proper, as distinguished from the foyer and office, is located in a one-story brick building measuring 150 ft. long by 100 ft. wide, and containing windows only around a border directly below the roof. It is reached through a foyer 120 ft. long. These arrangements to minimize the penetration of heat and reduce the duty on the refrigerating equipment are supplemented by heat insulation around the ice.

Covering the concrete foundation which supports the rink is a layer of 2-in. cork slabs laid with the long dimension across the rink. The seams running lengthwise of the rink are staggered. Over this insulation was laid another layer of cork boards with their long dimension lengthwise of the hall. No attempt was made to stagger the seams of the upper layer. Oiled canvas ⅛ in. thick, sewed and cemented together in one piece, was placed over the entire area and turned up on all sides to form the ice tank. The brine pipes, which are 1.25 in. in diameter, are placed about 3 in. apart on short wooden strips to allow the water which has to be frozen to completely surround them. The ice is 6 in. to 7 in. thick, making the entire tank when full weigh about 102 tons. About forty-eight hours is required for the initial freezing.

ENGINE ROOM EQUIPMENT

The engine room, which is only 39 ft. long by 19 ft. wide, is an example of how space can be economized by using electric drive. It contains a belt-driven ammonia compressor, a brine circulating pump, a brine tank and condenser, ammonia tanks, high-tension oil switches and transformers. The compressor is a 35-ton Vose machine, having a 10-in. by 22-in. cylinder and operating at 90 r.p.m. The motor driving it is a 100-hp., two-phase, 2000-volt, 720 r.p.m. General Electric unit. A high-voltage compressor motor was employed to avoid using a large transformer and to eliminate the consequent transformer losses. A two-phase machine was

used since the distribution service in this district is of that type.

On account of the small space obtainable in the engine room Lennox belt transmission was used between the brine pump and its driving motor. The pump is a 150-gal. 6-in., by 8-in. triplex unit, and the motor a 10-hp. single-phase type K. S. wound rotor General Electric machine. Owing to the great length of pipe (25,000 ft.) in the ice tank a friction head of about 10 lb. per square inch is exerted against the pump. This is much lower than was originally expected, however. At present there is no duplicate pumping system, but a centrifugal pump will be installed shortly. The brine-pump motor is supplied with energy from a 25-kw., 2800/110-200-volt transformer, used also to energize the lighting circuits.

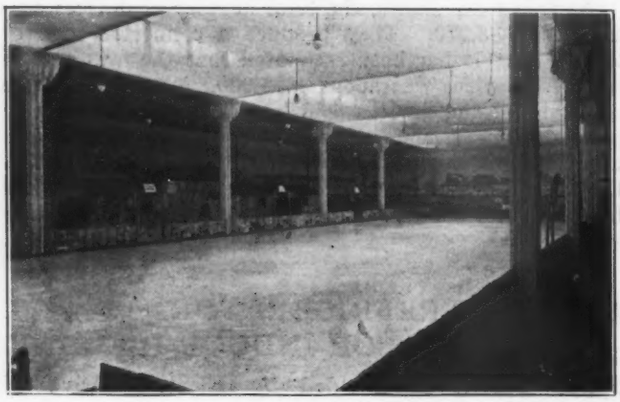


FIG. 1—INDOOR ICE RINK ILLUMINATED BY 500-WATT GAS-FILLED LAMPS

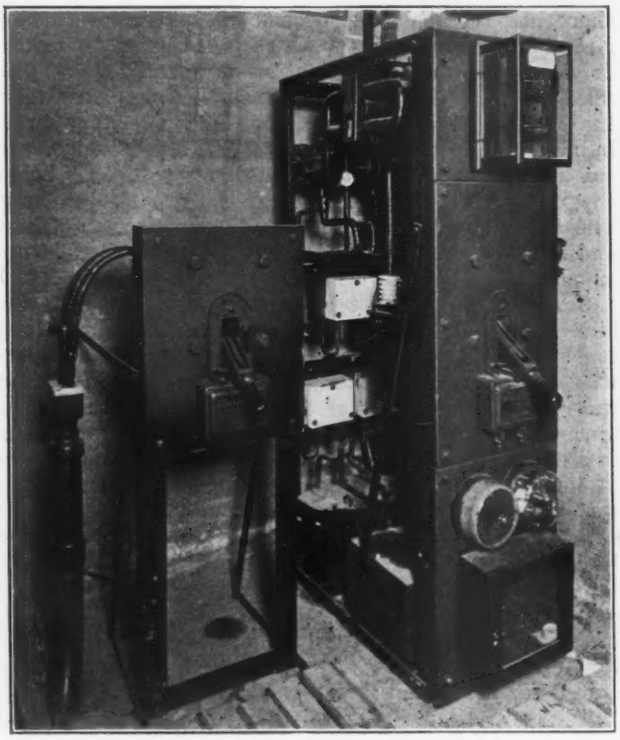


FIG. 2—REFRIGERATION CONTROL APPARATUS AND INCOMING SERVICE CIRCUITS

The hall containing the rink is illuminated by thirty-one 500-watt gas-filled lamps inclosed by opalescent globes, hung about 18 ft. above the ice. The lamps are staggered as shown in an accompanying illustration. Twenty-three units are arranged to light the rink while the remainder illuminate the flocred border around it. The illumination obtained with this equipment is considerably more than necessary, it being estimated that 30 per cent less wattage would afford adequate lighting. A novel feature of the rink is that the rails, trim, benches and rooms for checking coats and putting on skates are made of white birch with the bark left on the wood. Around the upper portions of the walls is painted a scene of snow-capped mountains. The ceilings are also white.

Energy Consumption and Maximum Demand

Two-phase, 60-cycle, 1950-volt energy is supplied for motor service and 2800-volt, single-phase energy for lighting and small motors by the United Electric Light & Power Company. During the short period the plant has been in operation the maximum demand has been approximately 80 kw. and the energy consumption about 621 kw.-hr. per day. The consumption given includes the energy for operating all of the refrigerating equipment, lighting the rink, signs, offices and engine room and that lost in the 50-kw. transformer. The service is supplied on a high-tension rate, which is $30 per kilowatt-year plus 1.5 cents per kilowatt-hour used.

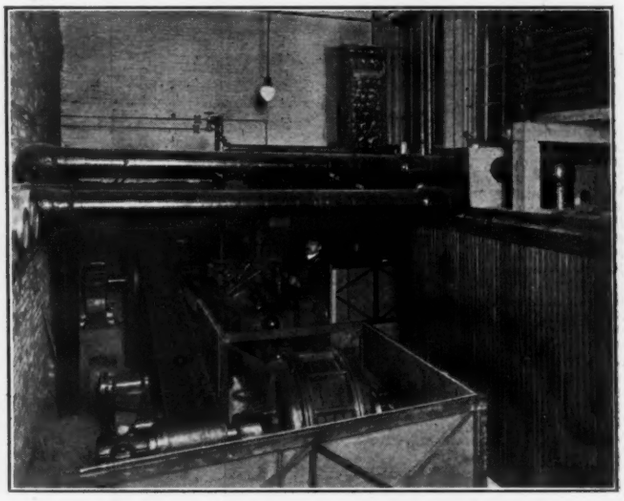


FIG. 3—AMMONIA COMPRESSOR DRIVEN BY HIGH-VOLTAGE MOTOR

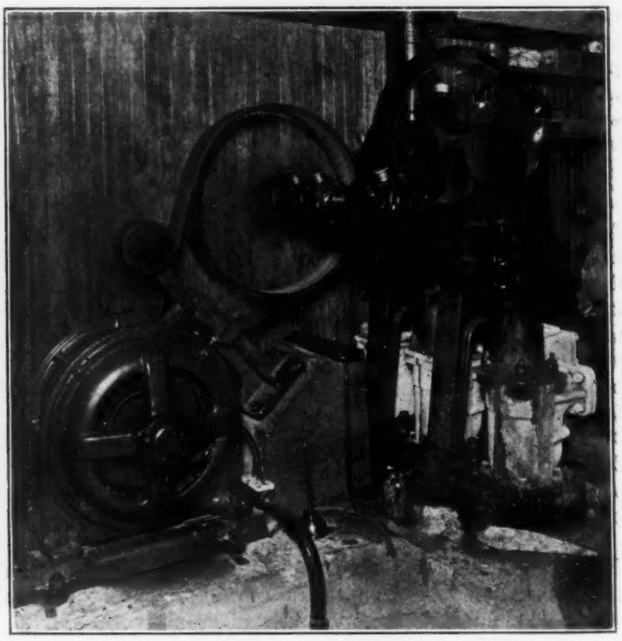


FIG. 4—COMPACT ARRANGEMENT OF BRINE PUMP AND DRIVING MOTOR

Providing Adequate Street Illumination for Unusual Local Conditions

Methods Used in New York City to Overcome Construction and Traffic Conditions That Interfere with the Installation of Standard Supports for Street Lighting Units

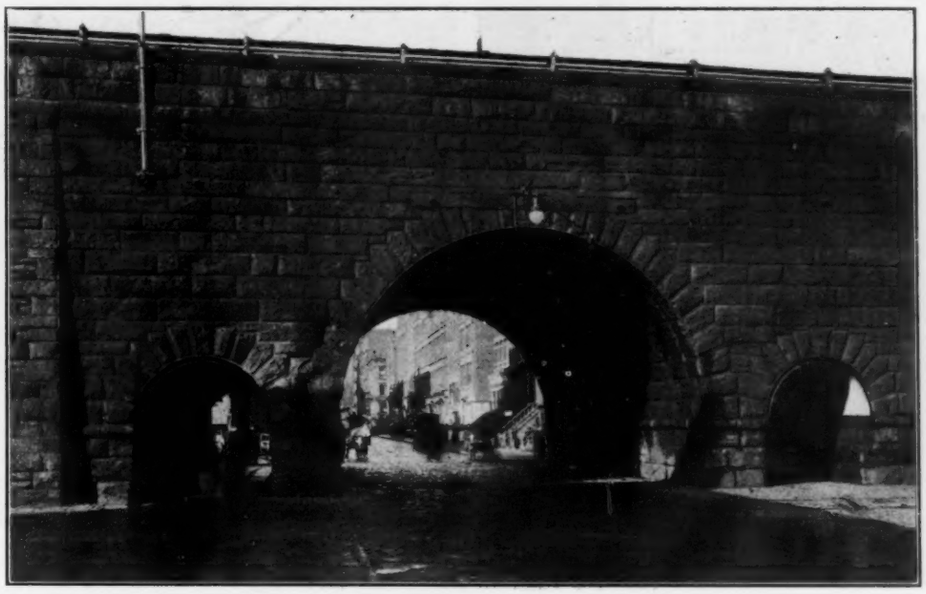


FIG. 1—LIGHTING OF VEHICLE AND PEDESTRIAN PASSAGEWAYS UNDER A RAILWAY STONE VIADUCT IN NEW YORK CITY

FREQUENTLY peculiar local conditions are encountered in a large city which compel extraordinary effort in securing proper street illumination, especially where elevated railway structures, tunnels, peculiar building formations and traffic conditions must be dealt with. Particular attention is given to these matters by the engineers of the Department of Water Supply, Gas and Electricity of New York City, who have jurisdiction over the street lighting conditions, and by the engineers of the local lighting company. The New York Edison Company has designed special brackets and post supports so as to locate the lighting unit in such a manner that the best illumination results will be obtained. A recent installation of interest in this connection is on Park Avenue between 102d and 110th Streets, where the overhead stone viaduct structure of the New York Central Railroad occupies the center of the thoroughfare. This is a solid structure with the exception of the passageways for vehicles and pedestrians at the intersecting streets. The standard practice of locating the lighting unit on the curb of the intersecting street was of little practical use in this instance, for by so placing the lighting unit sharp and well-defined shadows would be created in the arches through the structure. After a study of the situation it was decided to place the light source as shown in Fig. 1. It will be noted that a bracket supports a 300-watt Mazda type C lamp placed above the vehicle passageway while a 100-watt incandescent lamp is located in the pedestrian passageway. A rather novel installation in conduit work was accomplished here, extraordinary effort being made to so locate the conduit work as to make it unobtrusive. The conduit was installed around the arch as shown in the illustration.

A novel installation for lighting sections of the transverse roads of Central Park is illustrated in Figs. 2 and 3. The retaining walls of these transverse roads vary considerably in their height above the sidewalk. Here a special type of post was adopted which could be lengthened or shortened, both as to height or projection, in such a way as to meet variations in vertical wall dimensions or of the curb line. The two illustrations show practically the same post. In Fig. 2 the post base was placed on the grade, and in Fig. 3 the same post was used at a point where the wall was high, but in such a way that the light source in each case is on the same horizontal plane.

In several thoroughfares the elevated railway structure occupies the roadway area from curb to curb. Frequently this structure is quite low and lighting posts specially designed for the individual locations are required. In lighting installations of this character it will be appreciated that the low-hanging steel work above the roadway of necessity requires that the light source always be in view to prevent sharp shadows. A typical installation is shown in Fig. 4.

A type of bracket used in traffic congested thoroughfares is shown in Fig. 5. This particular location is at Twenty-eighth Street between Eleventh and Thirteenth Avenues, New York City, just outside the terminal stores, where, it will be noted, there is a total absence of sidewalk. In fact, the entire street is devoted to vehicle traffic, the loading and unloading being done from platforms built along the building fronts. Here, of course, a post installation would seriously interfere with traffic and, furthermore, it would be quite impossible to maintain post equipments where traffic is so congested. The installation supported on the shed as shown was therefore adopted. Care must be exercised in installations of this character so to place the light

FIGS. 2 AND 3—SPECIAL POSTS AND BRACKET EXTENSIONS INSTALLED ON TRANSVERSE ROADS OF UPPER CENTRAL PARK IN NEW YORK CITY

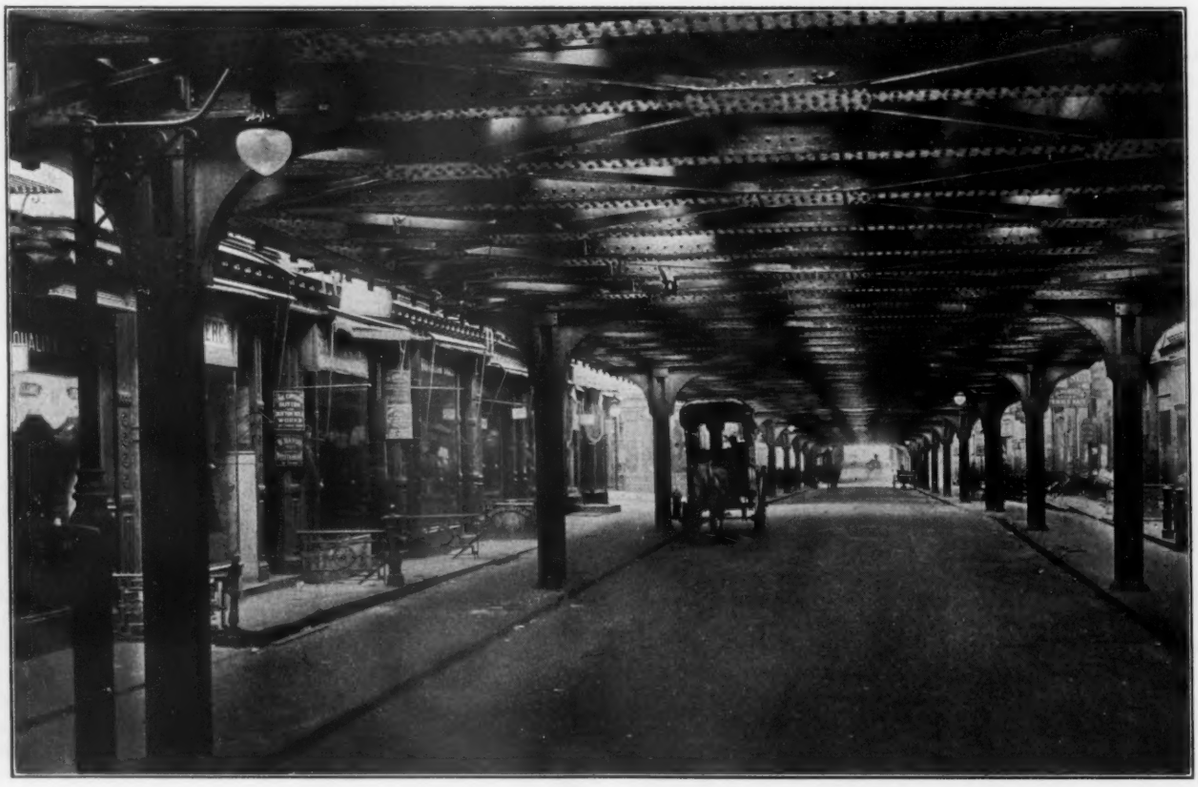


FIG. 4—INSTALLATION OF LIGHTING UNIT ON POST BRACKET UNDER NEW YORK ELEVATED RAILWAY STRUCTURE

Modifications of Lighting Standards to Meet Special Conditions

source that proper lighting of the street beneath the shed will be accomplished.

For lighting the Gansevoort Market inclosure in New York City on the west water front, the outrigger type of fixture shown in Fig. 7 was adopted. Here also the roadway is devoted to vehicle traffic, with the sidewalks entirely eliminated. The light source in this instance is located approximately in the center of the roadway, and therefore removed from the congested traffic conditions that obtain in this locality in the early morning hours.

On the water front at the places where the city's ashes, garbage and refuse are loaded for shipment, robust angle-iron structures are utilized to support the lighting units which, while not attractive, are very serviceable.

Other difficulties in providing supports for lighting units are encountered when the general rearrangement of certain thoroughfares below grade is under way. The building of the numerous rapid transit subway structures in New York City furnishes an example. Three different forms of post supports adopted to meet the several forms of subsurface reconstructed conditions along the lines of these new rapid transit subways are shown in Fig. 6.

The retaining walls on either side of the subway inclosure, that is, the concrete wall structure supporting private property from the subway right-of-way will at times vary inside and outside of the street curb. Again, the subway roof will vary in depth below the sidewalk line. Ventilating chambers along the curb line are installed at frequent intervals. All of the above details required special attention when foundations for city lampposts were considered, with the result that standard forms of lamppost subsurface construction were created to meet any condition that may be encountered along the subway right-of-way. The post foundations can be classified on the following basis: 1. Post set in the ventilating or fan chamber. 2. Post set in a subway or vault retaining wall. 3. Where the subway structure does not interfere and standard post construction can be accomplished.

The sectional diagrams show these types of installation, each of which is capable of wide variation in detail of construction. Problems of waterproofing have to be met wherever the post rests close to a vault or retaining wall. This will be particularly noted in the ventilating chamber section where the subsidiary pipe passing through the subway retaining wall is built in under very complete waterproofing conditions.

Where the post is so located as to come directly in the subway concrete construction a collapsible core together with the subsidiary pipe connection are first located. Around this the concrete is flushed, and as the mass solidifies the collapsible core is removed and the post shaft inserted. In the ventilating fan chambers special angle-iron and I-beam construction is required supporting a heavy cast-iron footplate, which in turn supports the steel tube. This tube passes up between the sidewalk beams and is supported by the sidewalk concrete construction. The post shaft proper is then inserted in this tube.

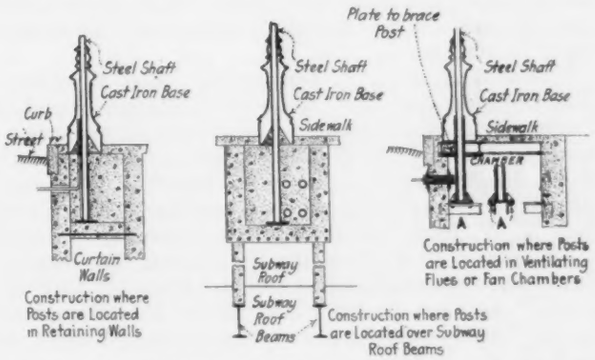


FIG. 6—POST SUPPORTS ADAPTED TO SEVERAL FORMS OF SUBSURFACE RECONSTRUCTION

In view of the extremely varied conditions encountered in the installations such as outlined in this article, it will be appreciated that regardless of the care exercised in laying out street lighting installations by means of maps, it is absolutely essential to locate the light source to accommodate conditions as they are found in the field.

FIG. 5—LIGHTING OF A STREET WITHOUT SIDEWALKS AND DEVOTED TO HEAVY VEHICLE TRAFFIC

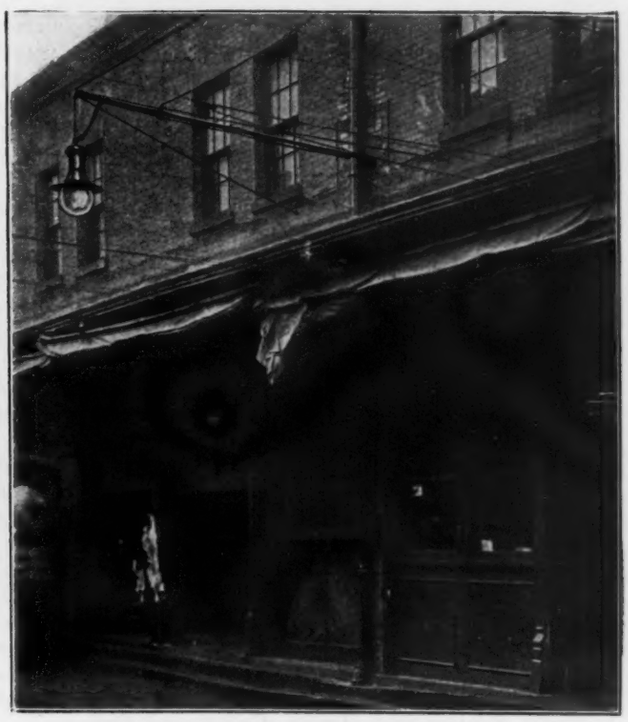


FIG. 7—AN OUTRIGGER FIXTURE FOR LIGHTING A TRAFFIC CONGESTED ROADWAY

Pacific Coast Convention of the A. I. E. E.

Inductive Interference, Insulator Testing and Electric Heating Subjects of Live Discussion at the Seattle Institute Meetings

In last week's issue of the ELECTRICAL WORLD abstracts of papers and discussions were published as presented at the Seattle convention of the Northwest Electric Light & Power Association held at the same time as the Pacific Coast convention of the American Institute of Electrical Engineers, Sept. 5 to 9. In what follows the subjects discussed at the Institute meeting are given in abstract.

The first A. I. E. E. session was called to order on Tuesday morning, Sept. 5, by C. E. Magnusson of the University of Washington. The address of welcome was made by Mayor H. C. Gill of Seattle and was responded to by Prof. Harris J. Ryan of Stanford University. Dr. Magnusson then turned the meeting over to President H. W. Buck and R. W. Pope, honorary secretary.

The paper on a "Distribution System for Domestic Power Service from Commercial and Engineering Standpoints," by Carl H. Hoge and Edgar R. Perry, Puget Sound Traction, Light & Power Company, Seattle, was read by Mr. Perry.

M. T. Crawford, Puget Sound Traction, Light & Power Company, Seattle, suggested the use of 2200 volts direct to consumer's premises with a transformer for each house, or each small group of houses. The suggestion was indorsed by Robert Howes, consulting engineer, Seattle, who pointed out that although more costly it would reduce operating costs and improve regulation.

F. D. Weber, Underwriters' Equipment Rating Laboratory, Portland, brought out the fact that in Seattle the average small family probably has yearly bills as follows: heating, $75 (coal and wood furnaces); cooking and water heating by gas, $35; lighting, $40; total, $150.

Temperature Rise in Cables

The first paper on Tuesday afternoon was "Some Features of Domestic Electric Cooking and Heating," by H. B. Peirce, Washington Water Power Company, Spokane. In commenting on this subject Dr. Magnusson said that resistance type heaters often have the disadvantage of requiring frequent repairs and that the induction type have a low power factor. He exhibited an induction type heating unit developed in the University Laboratory that had a power factor of 98 per cent. Others who added comment were L. F. Curtis, Washington Water Power Company, Spokane, and Messrs. Fisken, Peaslee, Perry and Pope.

The paper on "Temperature Rise of Insulated Lead-Covered Cables," by Richard C. Powell, Pacific Gas & Electric Company, San Francisco, was commended by President Buck as a valuable reference because little data on this subject is on record. He spoke of experience at Niagara Falls, where tremendous variations in cable temperatures were caused when the condition of the surrounding soil changed from moist to dry.

Sherwood C. Lindsey, Puget Sound Traction, Light & Power Company, described a scheme for relieving a hot point in a duct by installing a fan and extending the vent up a convenient pole to induce draft. Mr. Fisken suggested the use of exploring coils and also, in large duct lines, leaving vacant a central conduit through which test temperature readings could be taken. Others who added comment were M. E. Cheney, Fire Underwriters, Seattle; H. F. Holland, Simplex Electric Heating Company, Los Angeles; Robert Howes, consulting engineer, Seattle, and Messrs. Collins and Crawford.

Wednesday morning's session was opened by H. W. Buck's presidential address, an extract of which appeared in the ELECTRICAL WORLD for Sept. 9. The paper on "Inductive Interference as a Practical Problem," by A. H. Griswold and R. W. Mastick, Pacific Telephone & Telegraph Company, San Francisco, was read by Mr. Mastick. By means of wall charts solutions of a series of practical problems were described, so that the method of arranging the transpositions which is the remedial measure exclusively used, could be explained in detail. Interference not remedied by transposition it was pointed out, is that resulting from too frequent grounding of line neutrals and unbalanced loading.

Those who entered into the discussion were Dr. Frederick Bedell, Cornell University; R. F. Robinson, Pacific Telephone & Telegraph Company, Seattle; L. J. Corbett, University of Idaho; Cyrus A. Whipple, consulting engineer, Seattle, and Mr. Fisken. About fifteen telephone engineers were present.

Wave Form as Factor in Inductive Interference

The Friday morning session was opened by the reading of a paper, "Characteristics of Admittance Type of Wave Form Standard," by Frederick Bedell. The discussion was led by Messrs. Merwin and Mastick, and Messrs. Curtis, Corbett, Fisken, Peaslee, Ryan and Dr. Bedell participated.

In commenting on Dr. Bedell's paper, L. T. Merwin said: "The study of this paper from the standpoint of the practical power man brings out two important points one of these has been forced upon the attention of power men particularly on the Pacific Coast, due to the active interest in the phenomena of inductive interference, and the other has hardly been given the weight that it deserves. Reference is made in the latter instance to the detrimental effect that the presence of certain high harmonics may have on the power system itself. As transmission and distribution systems become more and more ramified, transmission distances greater, and voltages higher, the presence of high harmonics in the wave form are bound to give increasing concern due to possibility of resonant conditions in particular branches of the system. It will be easy not only to alter the configuration of the network by means of inserting impedances to clear the system of the effects of higher harmonics, but to foresee possible dangers and so design systems to avoid effects due to the presence of high harmonics.

"The penalizing of the generators on account of the wave form that may be sent out on the line is scarcely to be approved, particularly when this penalizing costs money, as it certainly will. On the other hand, if the presence of high harmonics produces undesirable and detrimental effects upon the lines of communication of the telephone companies, it will certainly be to his interest to avoid that generation wherever possible. There are many instances, however, where other methods can be used—for example, in the case of a simple parallelism that can be readily handled by a system of transposition where it might be far cheaper to accept the present of harmonics and apply remedial measures as against the effect of inductive interference. Since it is possible to take care of the effect of any harmonic, in so far as a system is concerned, by proper design, and since a com-

paratively limited range of higher harmonics interfere with speech transmission, it would seem advisable that any standard to be used as a basis of penalty should consider that particular range of higher harmonics that appear in the study of inductive interference."

California Commission on Wave-Form Standard

The California Railroad Commission's joint committee on inductive interference in a written discussion on Dr. Bedell's paper pointed out the importance of wave form as a factor in determining the extent of inductive interference with telephone service where power and telephone circuits are parallel. Its importance, from the point of view expressed, renders particularly desirable the adoption of a suitable method of measurement and the enforcement of the lowest practicable limiting value of distortion of wave-forms of rotating machinery measured by such standards. In the view of the committee an admittance standard for determining the distortion factor of an e.m.f. wave is eminently suitable and has a great advantage over methods requiring a tedious analytical or cut and try process.

It is pointed out that the most difficult problem to be solved before settling upon a particular circuit to be employed in measuring the distortion of wave form is to determine the relative detrimental effects of different harmonics in electrical machinery wave forms under representative conditions of operation. This involves, besides a knowledge of the varying frequency of the damage due to induced current in telephone receivers (physiological effect), a consideration of the distortion of wave form of voltages and currents which takes place between the telephone receiver and the rotating machinery of the power system. It is thought on the part of the committee that somewhat arbitrary assumptions will have to be made in evaluating many of the factors, links in the chain between telephone receiver and generator. It is believed that a standard for penalizing the higher harmonics to a greater degree requires preferably a composit circuit rather than the simple circuits described by Dr. Bedell.

H. S. Osborne pointed out that from the standpoint of inductive interference in telephone circuits the relative weighting of harmonics of different frequencies is of importance, both in connection with the consideration of wave-shape standards and for practical use in the investigation of induced noise in telephone circuits, particularly in considering the relative effect of different generators on other electrical machinery in producing interference in a given parallel.

The work which has been done to date indicates that the interference effect of a compound wave shape can be represented as the square root of the sum of the squares of the effects of the sine components of the wave. An interference coefficient of an alternating current wave can be defined as proportional to

$$k = \sqrt{E\ (V_f \times D_f)^2}$$

where V_f is the voltage component of the wave of frequency f and D_f is the corresponding ordinate.

In establishing a standard of wave shape the inductive effects in telephone circuits are, of course, only one of the several factors which must be taken into consideration, such factors as the effect of harmonics on the operation of power circuits and the difficulty in obtaining a desired degree of reduction in the magnitude of voltages of any given frequency should be included. The R. L. C. standard described by Professor Bedell, where the condenser is predominant at fundamental frequency with resistance equal to the condenser reactance at resonance, and with a high resonance point, can be made to very closely approximate a standard of this sort for the frequencies commonly generated in electrical machinery.

Dr. Bedell, in closing the discussion of his paper, explained that at the present time, our knowledge is not sufficient to specify the exact characteristics of a wave-form standard. The requirements are so complex that possibly it may be that there is no ideal standard that can be precisely defined, and that in endeavoring to obtain such a standard, we are accordingly seeking the unobtainable. However, he believed that a suitable working standard can be obtained.

Field Test for Defective Insulators

At the Wednesday afternoon session, presided over by Mr. Fisken, the paper on "Testing for Defective Insulators on High Tension Transmission Lines," by B. G. Flaherty, Puget Sound Traction, Light & Power Company, was read. In commenting on this paper Professor Ryan stated that the design of high potential insulators is secondary to the material used. Refractory material which vitrifys only at high temperatures and which is as nearly nonporous as possible is essential. Now that fused silica is being used for facing brick the day of the quartz insulator seemed nearer, he thought. As evidence of the unreliability of modern insulators, he cited the case of a shipment that had been accepted and stored for four years, after which the usual tests showed 23 per cent faulty.

Mr. Merwin described his success in detecting leaky insulators by the use of a De Forest audion amplifier with a high resistance head set and an 8-ft. wire on a bamboo pole as antennæ.

Others who discussed the paper were A. E. Loew, University of Washington; George Harding, Washington Water Power Company, Spokane; Charles Osborne, Puget, Wash.; Dr. Magnusson and Messrs. Pope, Peaslee and Crawford. Written discussions by Dr. E. E. F. Creighton and by John B. Taylor of Schenectady, N. Y., were also presented. An abstract of the former was given on page 571 of last week's issue.

The paper on "A High Voltage Potentiometer," by Harris J. Ryan, was read by the author, and a paper on "An Artificial Transmission Line with Adjustable Line Constants," by C. Edward Magnusson and S. R. Burbank, was read by Dr. Magnusson and discussed briefly by J. D. Ross, superintendent lighting department, Seattle, and Messrs. Ryan, Corbett, Peaslee and Whipple. The meeting then adjourned until Friday morning, when all present were invited to attend the Thursday session of the N. W. E. L. & P. Association.

The paper on "Insulation Failures Under Transient Voltage," by W. D. Peaslee, was read by the author who showed samples of typical ruptures in insulators. This paper was abstracted on page 572 of last week's issue.

Questions arising in the discussion by R. M. Boykin, consulting engineer, Portland; A. A. Miller, Westinghouse Electric & Manufacturing Company, Seattle; Messrs. Ryan, Howes, Fisken and Merwin, were summed up in closing by Mr. Peaslee, who said that present methods of connecting lighting arresters and not the type of arresters are responsible for throwing onto the line the two million cycle waves that have done much insulator damage. He referred to a sphere-gap, horn-gap type of arrester on which experiments are soon to be made and suggested a full metal cap over the top of pin type insulators so that the stress would be distributed more evenly. He pointed out that since insulators which absorbed even 0.1 per cent of moisture would not stand up under test, that porcelain insulators should be closely watched.

As to the question of whether the small punctures in the faulty insulators shown were formed progressively, he showed specimens that clearly indicated slight but repeated partial failures in zones of flux density, which seemed to substantiate this theory.

COMMERCIAL AND BUSINESS POLICY

A Department of Plans and Methods for Widening the Application of Electricity and for Extending Electric Service

The Importance of Teaching the Purchaser of a Range How to Use It

"The consensus of opinion of all who had anything to do with range sales work is that too much stress cannot be laid on service selling when placing electric ranges, particularly so during the exploitation period," pointed out W. R. Putnam, chairman of the electric range committee of the Northwest Electric Light & Power Association in his report before the convention on Sept. 6.

"The majority of companies which are successful in selling ranges place a few ranges in each district and have a demonstrator or salesman live with these ranges until the customer is absolutely satisfied with the range and understands its operation thoroughly. This may take from thirty to sixty days, but when a range is finally placed in this way it not only secures a satisfied customer, but is a very active sales force in this neighborhood.

"In general, central stations are finding that the longer they continue in the electric range game the easier it is to sell the higher-priced ranges, as customers desire the most efficient range."

Advertising Electricity to the Advertising Men

To the end that even current advertising in the popular press shall carry the refrain of "Do It Electrically," the Society for Electrical Development, Inc., has addressed a circular to the advertising fraternity, pointing out that "no matter whether your business is to advertise and sell 'ship or shoes or sealing wax,' somewhere along the line electricity is helping to speed the machinery of production, transportation or distribution."

"Every word, every picture, every sales plan that goes out of your establishment during the next months," urges H. W. Alexander, director of publicity, "should do its best to jibe with the 'Do It Electrically' spirit which is in the air."

Accompanying the letter is the memorandum sheet, reproduced herewith, pointing out that the modern home is fast becoming an electrical home, and that every opportunity should be grasped to show it as such. "In a coffee advertisement, for instance," it is declared, "the percolator has succeeded the coffee pot. Now let it be an electric percolator.

"To do things electrically," concludes the letter, "is synonymous with doing them in a thoroughly modern, more efficient and better way."

ELECTRICAL PROGRESS

Nothing *ever* stands still in America.

You don't show women with balloon sleeves, nor automobiles with the body styles of six seasons ago.

The up-to-date home is electrical.

Electric lighting, heating, cooking, sewing, washing, ironing and cleaning are rapidly superseding the old way. The public is thoroughly sold on the idea of "doing things electrically."

Hence a friendly suggestion. It is this:—

Since the modern home is fast becoming an *electrical* home, take every opportunity to show it as such.

In a coffee advertisement, for instance, the *percolator* has superseded the coffee pot.

Now let it be an *electric* percolator.

The broom, likewise, gives way to the vacuum cleaner; the old-time flatiron, to the *electric* flatiron; the wash-tub, to the *electric* washing machine.

In the same way the home has become *electrically* lighted and the factory equipped with motor-driven machinery.

"Do it Electrically" is more than a slogan; it is the mark of progress—of up-to-date methods.

A PLAN TO MAKE EVERY ADVERTISEMENT A HINT TO "DO IT ELECTRICALLY"

Good Service Inspection Pays

An experience recently reported by a gas company is worth considering. This company instituted a good service inspection service and put a man at work, calling upon customers, inspecting the installation, making necessary adjustments and repairs and selling this and that as opportunity presented itself. In the first month this inspector made 550 calls where he actually talked to consumers. In more than 100 cases new gas lights were installed, in more than 250 cases old lights were adjusted, eighty open-flame burners were replaced and in almost 300 cases something was done to improve the service from the range, hot plate or water heater. And at the same time this man made incidental sales totaling $340, on which there was a profit of $95. Yet he was not a salesman, merely an inspector.

The same plan has been applied with unvarying success by central stations. In Denver a good service department has been in operation for a number of years and has proved both an aid to service and a source of money gains. It points to a field for selling of the most desirable kind, the increasing of incomes from already connected customers.

Leavenworth Company Pays Contractors $7 per Four-Outlet Free-Wiring Installation

The Leavenworth (Kan.) Light, Heat & Power Company has hit upon a plan of stimulating its wiring business that has resulted in good gains to its customer account. Leavenworth is one of the older cities of Kansas with a population of about 28,000, and with very many old homes, cottages and frame buildings. It has not grown much in recent years, and a very large proportion of its homes, are therefore, unwired. Three years ago the company decided to try to remedy this situation. A special free-wiring offer was made for the summer months, under which houses were wired with four open-

ings, drop cord and city inspection included, free of charge.

During the first season the company maintained a force, as previously, to do its wiring. The second season, and also this year, the company has made contracts with others to do the work. The company has an arrangement by which a flat price of $7 is paid to contractors (the arrangement existing with two contractors) for wiring houses for four openings.

The company announces to the public that wiring of additional rooms will be done at the rate of 50 cents a room, which is to be paid to the contractor doing the work.

In a few cases the contractors have lost money on the jobs, but apparently they have been pleased with the arrangement, for in most instances they receive orders for wiring additional to the four openings provided for in the offer.

Electric Hot Plates Develop Taste for Cooking by Wire

Following the policy of the gas companies who, in earlier years, found that the one and two-burner gas units were the forerunners of the gas stoves, the Puget Sound Traction, Light & Power Company of Seattle, Wash., has been featuring the sale of one and two-unit electric hot plates. Once it has been demonstrated how easy it is to prepare the meals on the electric hot plates there is, invariably, a desire to apply the same method to a larger share of the cooking. For $2 an oven can be purchased, such as is commonly used on kerosene stoves, which will just fit a two-unit electric hot plate. With this inexpensive equipment the kitchen has, within its limits, a complete electric range that gives surprisingly good results.

The hot plates are socket devices and therefore take lighting rates. Where the cooking rate is on a lower scale the range salesman can readily interest the lady of the house in the advantage of using electricity entirely for cooking, getting a lower rate, using a more efficient oven, etc.

Working on the policy of using the hot plates as a means of introducing ranges, the Seattle company has this summer sold 483 of the one and two-unit types. Up to Aug. 1 the summer campaign carried on by this company has also closed the sale of 225 electric ranges and eighty-six electric water heaters. It is expected that next year ranges will be placed in many of the homes where hot plates were introduced this season.

Progressive Farmers Utilize Electricity

Five progressive farmers on the lines of the Northern States Power Company near Faribault, Minn., have jointly purchased a 15-hp. motor and transformer mounted on a portable truck to permit the use of electricity for power purposes on their farms. The company has erected short lines from the transmission line to points near the barns so that when power service is required it is only necessary to move the motor to the point desired and connect it. By clubbing together the farmers brought the original cost of the power equipment down to a low figure for each. Manager Cowperthwait of the Faribault division says:

"We have installed several motors recently for the purpose of cutting corn and filling silos. It appears that a machine has now been put on the market which requires not to exceed 7.5 hp. for this purpose, and if this is satisfactory many such outfits will probably be sold next year."

VOLTAGE STANDARDIZATION

Experience of Ohio Companies in Adopting Definite Socket Pressures of 110, 115 and 120 Volts

In his paper urging the adoption of standard socket voltages by central station companies, read before the Northwest Electric Light and Power Association on Aug. 6, by M. D. Cooper of the engineering department National Lamp Works, Cleveland, Ohio, the author pointed out that while probably no one industry ranks ahead of the electrical industry in thoroughness of standardization, yet there is one feature of this industry which still showns a considerable lack of standardization—voltage of distribution.

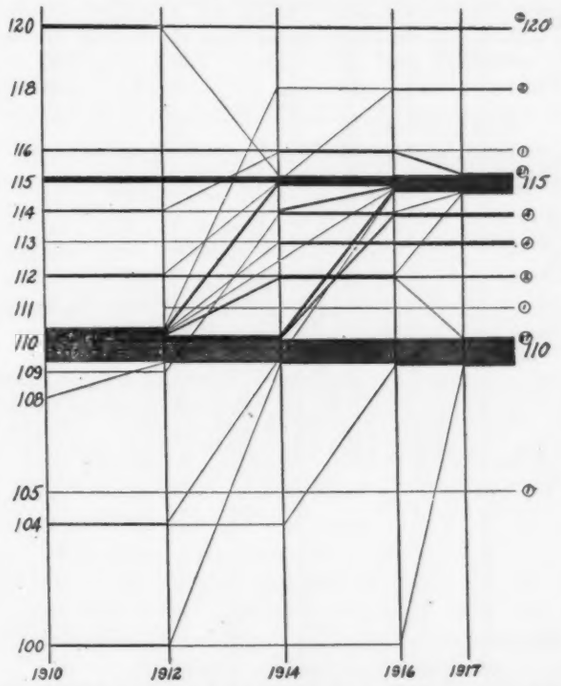


FIG. 1—VOLTAGES REPORTED BY OHIO CENTRAL STATIONS

While there is a standardization of ranges of voltages, such as 105 to 125, 220 to 250, etc., in any one of these ranges there is no commonly accepted standardization upon certain definite figures. If voltage standardization upon a very few figures could be brought about, declared Mr. Cooper, a very great benefit would accrue to the electrical industry. All such apparatus as has to be closely selected for voltage, such as lamps, heating utensils, etc., could immediately be manufactured and distributed with less cost, and the saving would eventually react to the benefit of the ultimate consumer. Not only would the production and distribution be cheaper, but it would be very much more rapid. Jobbers of electrical supplies could, for the same investment in stocks, carry more kinds and sizes of electrical apparatus where now they have to carry a variegated line of different voltages of apparatus.

The Ohio Electric Light Association has done some pioneer work on this question of voltage standardization, and the recommendation which their voltage committee made to their association a year ago was that the member companies of the association make every reasonable effort to standardize upon 110, 115 and 120 volts. These three voltages were selected in their recommendation of standardization because of their symmetry, and because it is found that an overwhelming majority of all central stations now operating in this country are embraced within the limits of 110 and 120 volts.

The fact that some central stations have increased

their voltage even as much as 10 volts over a considerable period of time shows that where necessary for standardization such changes can be made. These stations which have made considerable increase in voltage have not, of course, made the change at once, the total change has been split up into smaller changes and the lamp voltage has been gradually increased as the line voltage is increased. In this way, by making the change gradual, little or no complaint of short life has been experienced.

The chart in Fig. 1 shows a summary of the voltage at which the member companies of the Ohio Association have operated over a period of years. Each station is

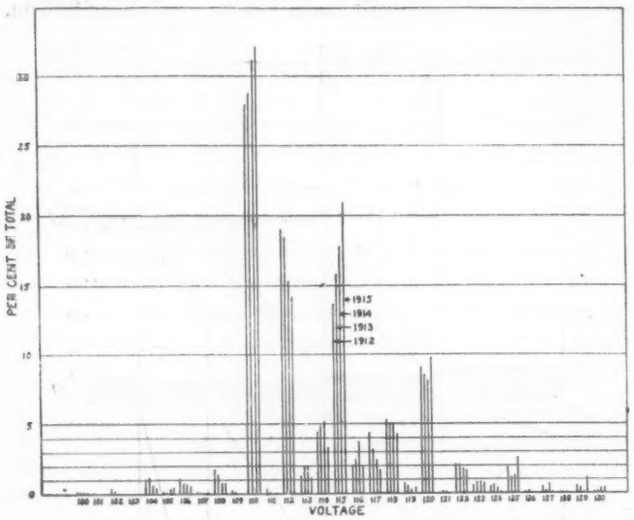


FIG. 2—DISTRIBUTION BY VOLTAGE OF 25, 40 AND 60-WATT LAMPS SHIPPED BY ONE LARGE MANUFACTURER

represented by a line and the progress of the line across the page indicates at what voltage the station has operated at various times. The most noteworthy feature of the diagram is the very much greater concentration upon the so-called "standard voltages" at the present time in comparison to the wider distribution with regard to voltage in former years. Another noteworthy feature is the upward tendency in such voltage changes as have been made. This latter feature could be anticipated, however, when we reflect that load capacity of lines and range of distribution increase with the voltage.

It is interesting in connection with this question of voltage standardization to inspect records of lamp shipments over a period of a few years. The chart in Fig. 2 gives a record of the shipments of Mazda lamps by the National Lamp Works of the General Electric Company over a period of years from 1912 to date. It will be noted that the most prominent voltages as indicated by this chart are 110, 112, 115 and 120. At each voltage figure there are four lines erected, one for 1912, one for 1913, one for 1914 and one for 1915. The comparative height of these lines serves to indicate the trend of the prominence of any individual voltage; for instance, it is noted that 110-volt lamps are becoming progressively a greater and greater percentage of the total volume of lamp business; 115 shows even a more marked rate of increase than does 110, while 112 is dropping off at about the same rate that 115 is increasing. Although 120 decreases slightly for the first three years, it has now begun to show a rate of increase. It is the manufacturer's belief that the increase in the percentage of 110-volt shipments is due very largely to increases in voltage on the part of central stations from some figure less than 110 up to 110, and that the marked increase of 115-volt shipments is due very largely to a shift from 112 to 115. Taking this chart as a whole, it shows that there is a very pronounced tendency toward standardization in the central station industry in this country at the present time, for 110, 115 and 120 are all showing a marked rate of growth, whereas practically all other voltages are showing a decline in prominence.

"We, as lamp manufacturers," said Mr. Cooper in closing, "admit a considerable proportion of the responsibility for the diversity of voltages in use to-day. The tendency of the electrical industry has always been to standardize, but in the days of the old carbon lamp it was impossible to foretell accurately the voltage of the finished lamp, hence the manufacturers of lamps urged a diversification of voltages in order that the trade might participate in the economic benefit they experienced through being able to dispose of all of their product. Developments in the art of lamp manufacture have now progressed to such a degree that lamps can be made to conform accurately to any desired voltage. Since incandescent lamps require a closer voltage selection than any other device, lamp manufacturers must be among the first to adapt themselves to voltage standardization. By reason of the developments in lamp making, which enable the accurate predetermination of the voltage of the finished lamp, we believe the greatest obstacle to a universal standardization of distribution voltages has been removed."

Central Station Income at Malone, N. Y., Doubled in Two Years

Within a period of little more than two years the gross revenue of the Malone (N. Y.) Light & Power Company has doubled, and the company's connected motor load, from 600 hp. at the beginning of 1914 has increased to about 3400 hp., as the result of contracts closed with local mill owners and power users, small and large.

Several of the prosperous farmers along the company's new 15-mile line in the Bangor district are using power for separating, churning, feed cutting, etc. The Malone company has done considerable along educational lines with the farmers, and the results of this work are already becoming evident from their interest expressed in electric service.

The number of electric lighting customers has increased from 750 in 1913 to nearly 1300, to date, according to H. C. Wilder, manager. A number of energetic new-business campaigns are responsible for this growth. Last spring the company had a $12.98 kitchen-wiring campaign which was very successful and in nearly every case resulted in a complete housewiring job. This fall plans are being made for a campaign based on wiring an entire dwelling for around $50.

The policy has been to co-operate with the contractors. The latter have returned the confidence of the company and render valuable aid in making possible better relations with the customers.

The Malone company has also mapped out an interesting public policy that is meeting with great success. The principle adhered to by the central station is that "the customer is always right," and, except in rare cases where it is apparent that the central station is being imposed on, the company settles disputes according to the customer's wish. The new public policy of the company has found expression in a number of different directions. How well it has succeeded may be judged from a public meeting held a year ago upon the occasion of turning on a new ornamental lighting system in the business section, when, before several thousand persons, leading citizens of Malone expressed the thanks of the community for what the utility management had done for the town.

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

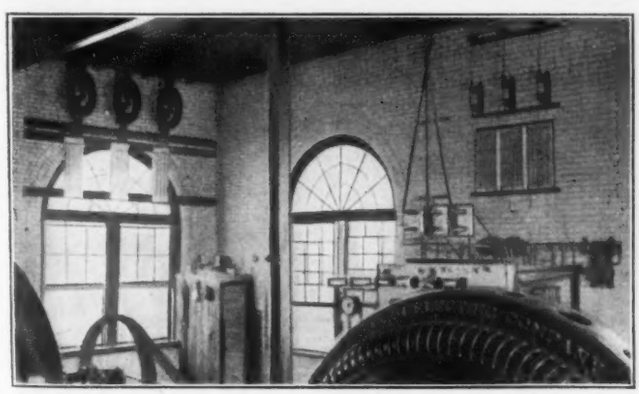
Turbine Draft Tubes Furnish Vacuum for Cleaning

By connecting its vacuum cleaner system with the draft tubes of the main turbines at Holtwood station, the Consolidated Gas, Electric Light & Power Company, Baltimore, Md., has made it possible to operate a cleaning system without using vacuum pumps. Outlets are provided at various places in the station so that a portable dust receiver and retainer can be connected thereto. This equipment with the flexible hose and various cleaning attachments are practically the same as used with ordinary vacuum cleaner systems. A dust receiver is employed with this system instead of allowing the dirt to be sucked directly into the draft tubes, because the humid air in the suction system would cause dust and suspended particles to adhere to the tubes and probably clog them up.

Multi-Path Arresters Reduce Equipment Losses in Michigan Plant

On the lines of the municipal electric light plant at Traverse City, Mich., unusual freedom from losses of equipment due to lightning has been experienced as a result of a very complete installation of multi-path type arresters. The district is claimed to be subject to severe lightning disturbances, but in the last four years since the present protection has been in use, the only piece of apparatus lost has been one 1.5-kw. transformer.

This protection is distributed over a 6-mile, 6600-volt line from the water-power generating station to the city, and the 25 miles of 2300-volt line in the city, and comprises some 150 arresters. At the power-house end of the 6600-volt line, a double set of six-path arresters



LIGHTNING ARRESTER INSTALLATION IN TRAVERSE CITY (MICH.) POWER HOUSE

is installed on the same line, as shown in the accompanying illustration. The choke coils are mounted immediately above the set at the left in the halftone. The set at the right shows a later method of mounting.

At the substation in the city, one 12-path set is installed on the incoming line, and a smaller 12-path arrester on each outgoing feeder. At intermediate points of the high-tension line, four small 4-path arresters are installed on each wire, with one of these installed on a pole in each group (never three on a pole) in order to secure three separate grounds at adjacent poles. The arresters used are the Gifford long resistance element, short air gap, multi-path type, invented by William Gifford, who is superintendent of the Traverse City municipal plant.

Unit Package Plan for Furnishing Jointing Material to Cable Splicers

When a cable splicer of the Commonwealth Edison Company needs material for splicing cables, he has to specify only the size, number and class of joints to be worked on. Further details do not have to be given because the material is made up in unit packages at the

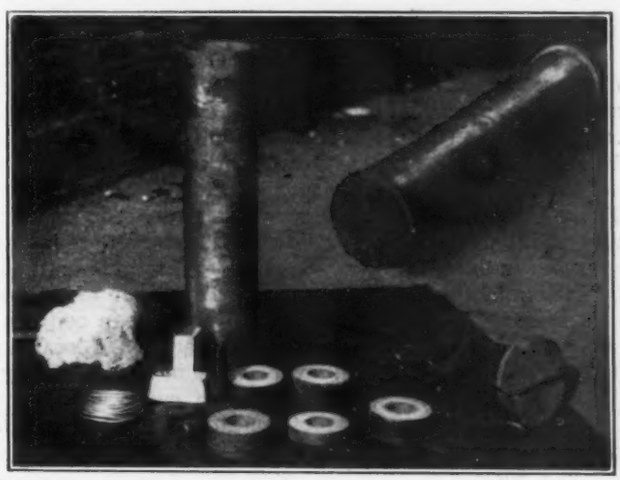


FIG. 1—CONTENTS OF SPLICER'S UNIT MATERIAL PACKAGE AND CONTAINER AS IT IS DELIVERED

storeroom, each package containing all the material necessary to make one complete joint. The 3.5 in. by 5-in. by 20-in. lead sleeves make very convenient containers for the material. They are therefore adapted to that purpose by closing the ends with hardwood blocks which are clamped together by 0.25 in. U-bolts which pass through the two blocks and inside the sleeve. Wing nuts are screwed on the ends of the U-bolts. Inside the sleeve are placed the tape, copper sleeves, string solder, wiping solder and waste. The ⅛ lb. of waste included helps to keep the material from rattling around. The pasters and soldering flux are not put in the package since it is impracticable to carry a unit amount of them. These materials are carried in quantities in the splicers' kits. The compound is also carried in a separate receptacle. When it is necessary to leave the unit packages in a damp place, the ends are dipped in melted paraffine and thus sealed to make the package watertight.

The tape for the unit packages is supplied in 18-yd. lengths so that the rolls will be small enough to fit inside the sleeve. The wiping solder which formerly came in 6-lb. bars is now made up in 2, 3, 4 and 5-lb.

ingots, so that just the right amount for various size joints can be inclosed. All the material included is figured close, so that there will be practically no waste, and yet there will be a sufficient amount. To determine the amount of each required the company made an extended study of the amounts used by the various splicers in order to strike a suitable average.

For No. 6 and No. 1/0 single-conductor joints, the material is made up in packages for four joints, since four separate packages would be awkward to handle and since there are nearly always four joints to be made in each place. In the rare cases where less than four joints have to be made at the same place, a package is broken and the balance returned to stock.

The unit-package plan has several advantages, the foremost of which is that the packages may be made up in slack times in the storeroom thus permitting the material to be handed out more quickly in rush periods than would be possible if the supplies were ordered out individually. Furthermore, unit packages are easier to handle during delivery and on the job, and the material is more easily ordered. In addition, allotting a definite quantity to each joint has resulted in a much greater uniformity of workmanship and quantity of material used in joints.

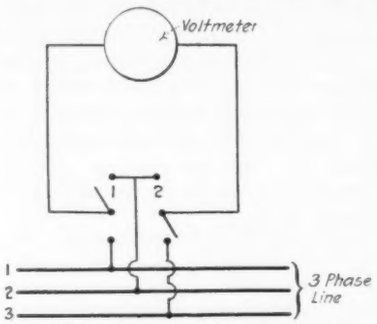
Experience with Protective Devices by New Jersey Company

Experiences of the Public Service Electric Company of New Jersey with various types of protective devices such as arcing ground suppressors, reactors, relays and machine-temperature indicators were related by N. L. Pollard and J. T. Lawson in a report presented recently before the American Institute of Electrical Engineers. The arcing ground suppressor has now been in service about five years and the records show that it has operated in every case where a fault to ground occurred, by extinguishing the arc and preventing an interruption to service. The faulty cable localizer used in conjunction with this equipment has greatly facilitated locating defective circuits. From experience in cable testing, the authors believe that a 13,200-volt cable should not be tested at voltages higher than 26,000, since too high a testing voltage often weakens the insulation and finally causes a complete breakdown even under normal operating voltage. Insulators which are now used have a radio of puncture to flash-over of about 2 to 1. In its newest station a selective bus scheme has been adopted which is a modification of the old arc-board scheme and is very flexible. To secure all the advantages of parallel operation of generators without suffering the disadvantages of short-circuits, the units are connected to a synchronizing bus by reactors but feed into independent busbars. Reactors are also used in all the 60-cycle feeders, 5 per cent being used in the radial circuits and 2½ per cent at both ends of each feeder. These have afforded the best selective action of the relays in case of trouble. To overcome rises of potential at the terminals of the concentrated inductance in the reactors, aluminum-cell arresters were installed on the buses, which, with the arresters already installed on the feeders, place protection on each side of the reaction.

From the company's experience with relays the conclusion has been reached that the most satisfactory results are obtained with radial distribution systems. Balanced selective relays have been found most satisfactory on the tie lines, no case having occurred where they have not operated properly. The nearest substitute for the pilot-wire relay scheme and one that has practically all the advantages is the split-conductor principle, according to the authors. The results obtained with air washers have led the company to conclude that if they are not used it may be necessary to remove the rotors of machines and windings of air blast transformers to clean the ventilating ducts or they will become so clogged that burn-out may result. Temperature indicators have been found very useful for indicating when a machine needs cleaning. Where air-blast transformers receive their air from a common air chamber the company has had them equipped with top and bottom dampers, so that in case of fire both can be closed and the fire smothered.

Method of Connecting Voltmeter to Each Phase of Three-Phase Circuit

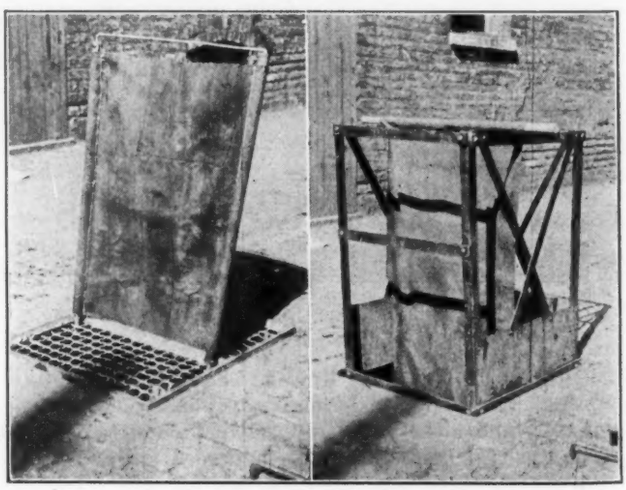
In the issue of the ELECTRICAL WORLD for July 1, page 26, a method of connecting a voltmeter for reading phase voltages of a three-phase line by the use of three single-pole double-throw switches was described. The accompanying diagram shows how the same end. may be accomplished by the use of two single-pole double-throw switches instead of three. The arrangement shown is accident and foolproof, as will be noted from the following connections. With switch No. 1 up and No. 2 down, the voltage will be that between wires 2 and 3; with switch No. 1 down and No. 2 down, the voltage is between wires 1 and 3; with switch No. 1 down and No. 2 up, the voltage is between wires 1 and 2. When both of the switches are up, the voltmeter does not register.



CONNECTIONS FOR TWO SINGLE-POLE DOUBLE-THROW SWITCHES ENABLING VOLTMETER TO READ PHASE VOLTAGES

Simple Arrangements that Improve Manhole Ventilation

The Commonwealth Edison Company of Chicago has found the arrangements shown in the accompanying illustrations convenient in certain cases to ventilate those manholes which are not particularly "gassy," but need more air than is provided by the natural circulation through the opening. The arrangements consist



FIGS. 1 AND 2—TWO TYPES OF WIND DEFLECTORS FOR VENTILATING MANHOLES

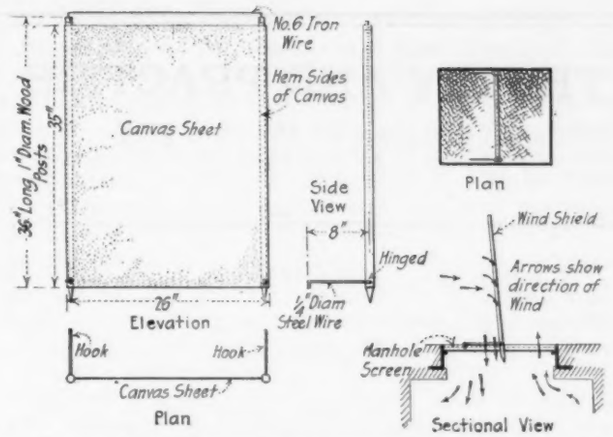


FIG. 3—CONSTRUCTION OF WIND DEFLECTOR FOR SCREEN-TYPE MANHOLE GUARD

of two types of canvas wind deflectors used in conjunction with the two types of manhole guards employed by the company and described in the ELECTRICAL WORLD, page 325, Aug. 12, 1916, issue. With the upright guard used in areas of more congested traffic, the deflector consists of a canvas sheet 50 in. by 26 in. wide with a 1-in. diameter wood pole sewed into each end. One pole rests across the top of the guard and the other hangs down in the center of the manhole neck about 24 in. below the surface. This is set to be across the direction of the wind, and as the breeze strikes the canvas it is deflected down the manhole, causing a circulation of air down one side and up the other.

With the screen type guard, the canvas is supported by two 1-in. diameter poles which hold the canvas upright across the center of the screen guard by means of two pieces of ¼-in. steel wire, shaped so that the end hooks under the wires of the guard mesh. A No. 6

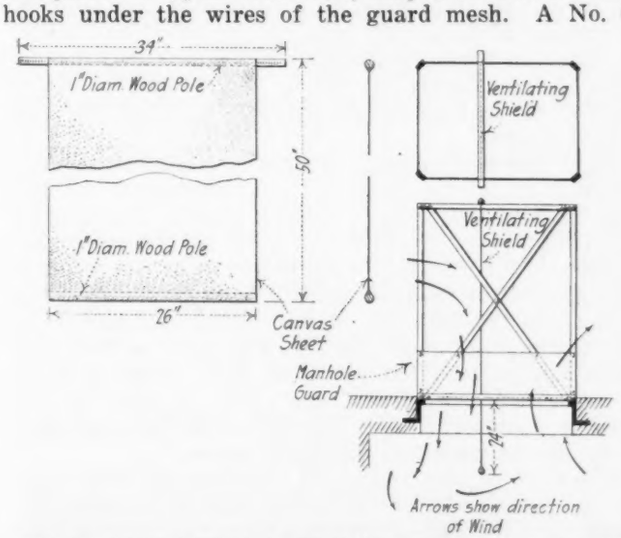


FIG. 4—CONSTRUCTION OF WIND DEFLECTOR FOR USE WITH UPRIGHT MANHOLE GUARD

steel wire across the top between poles keeps the 35-in. by 26-in. canvas spread. This is likewise set across the wind so as to produce ventilation as already described.

Driving Exciters by Both Turbines and Motors

If exciters are mechanically connected with their corresponding generators or are driven by motors with the main busbars, a short-circuit on a feeder may so reduce the speed of the exciters that the generator voltage will drop considerably below what it would if this exciter was driven by some independent source. This is especially objectionable when large factories employing large numbers of motor-driven machines are connected with the generator since the factory production will be reduced and a large number of employees affected.

At one plant in Bridgeport, Conn., the possibility of such conditions occurring has been minimized by connecting each exciter with both a turbine and a motor. The motor which is connected with the main busbars drives the exciter ordinarily. If the busbar voltage drops sufficiently, however, to cause a rotor slip exceeding 6 per cent, a governor automatically opens a needle valve in the turbine supply line causing it to take the load. If the bus is entirely de-energized the direct-current side of one exciter can be connected with an auxiliary bus to which all station emergency lamps are connected. This obviates the necessity of having to re-establish station service in the dark.

Convenient Cabinet for Filing Power-Plant Charts

The sketches herewith illustrate a convenient cabinet for filing the usual number and variety of power-plant charts, which include charts for recording the temperature of the outside atmosphere, boiler-feed wa-

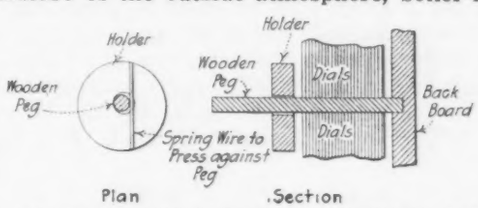


FIG. 1—METHOD OF HOLDING CHARTS ON PEGS

ter and heating returns, pressures of the boiler header, heating supply and returns and city water, steam flow meter, and the charts from watchmen's clocks. Large, white, distinctive lettering underneath each file of charts indicates clearly and readily the nature of their service. Heating and electric reports are filed, as shown, with the long rectangular demand charts laid lengthwise on shelves and held in place by suitable stationary clamps attached to each end. The demand charts are eventually rolled up and stored in the pigeonholes.

The fasteners for charts consisting essentially of wooden spindles with spring holders are constructed as shown in detail. These may be readily purchased, however, in a metal form of better appearance and with a black enamel finish. The cabinet is made of wood 0.5 in. thick, the over-all dimensions being 34 in. by 56 in. by 6 in. in depth. The cover is hinged and provided with a lock. Wooden fillets are used at the inside corners to reinforce the box.

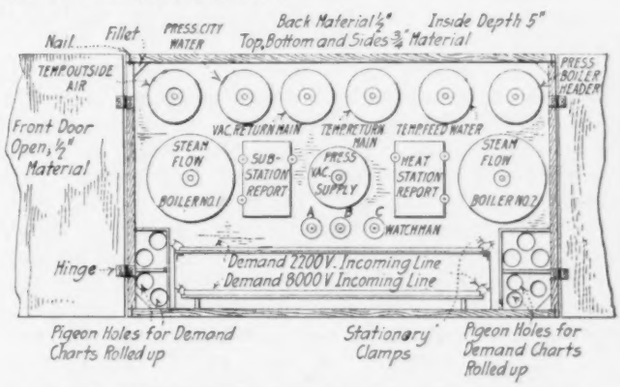


FIG. 2—ARRANGEMENT OF CHARTS IN FILING CABINET

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

TESTS ON OIL SWITCHES

Abstract of the Third Report of Swiss Commission on High-Tension Apparatus

THE third report of the Commission on High-Tension Apparatus and Fire Protection, appointed by the Swiss Electrical Society and the Association of Swiss Electricity Works, appeared in Bulletin 4, 1916, of the Schweiz. Elektrotechn. Verein and an English translation in abstract was published in London *Electrician* of Aug. 4, 1916. The previous reports of the commission were principally concerned with the determination of the energy developed in the switch when it is operated under given load conditions. The present report discusses the conditions to be fulfilled for the switch energy to be a minimum. The switch energy depends mainly on the magnitude and power factor of the load and for a given load the switch energy increases with increasing angle of lag of the load current, reaching very high values at a phase angle of 90 deg. The report discusses in detail the various factors which affect the switch energy and emphasizes the important influence of the power factor of the load. It is logical,

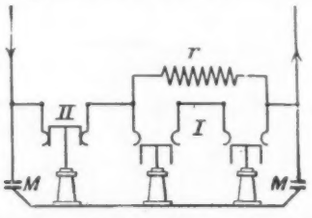


FIG. 1—SWITCHING ARRANGEMENT FOR RELIEVING MAIN CONTACTS OF SEVERE DUTY

then, to discuss two methods which suggest themselves for reducing the switch energy, one being reduction of reactance in circuit, the other introduction of a resistance into the circuit during the operation of switching.

The conditions under which oil switches are expected to operate may be classified under three groups. First, the switch has to break a definite useful load in kilowatts. The switch energy depends greatly on the power factor of the load, and the magnitude of the "switched load" is no measure of the loading of the switch.

Second, more frequently the switch is set to operate at a definite current. Again the magnitude of the "interrupted load" is no definite criterion of the loading of the switch.

Third, the switch has to open on a short-circuit. In this case the provision of a series reactance is a safeguard only in limiting the transient maximum value of the current, but does not relieve the switch, as it will generally not operate until several half periods have elapsed after the passage of the maximum current rush. It is not necessary or desirable that the switch should open during the large initial current rush, and we may, therefore, assume that the conditions will be such that the switch has to deal only with the normal permanent short-circuit current. A series reactance has the beneficial effect of reducing the value of this short-circuit current, and the harmful effect of increasing the duration of the arc.

The power factor and magnitude of the load to be controlled may be improved by the use of two-step switches that insert resistance on the first step before breaking circuit on the second step, but the limitations of this method will be seen in the discussion of the proportions in which the total switch energy is divided between the two steps of the switching operation. The main results of the investigation are as follows:

The oil switch suffers the maximum loading if it has to interrupt in one step the greatest short-circuit load that can take place at the point where it is installed. The provision of a preliminary step on which a reactance is inserted into the circuit does not insure a diminution of the switch energy. It is only possible to be certain that the switch energy will be diminished by this device if very large reactances are used, and in this event the protection given is afforded only to the second step of the switch, the first step having to break almost the full short-circuit load. If, however, reactance is included permanently in the circuit, a resistance inserted on the first step will certainly afford a protection and the switch energy will be a minimum if the resistance is chosen so as to be equal to the reactance of the path traversed by the short-circuit. The "interrupted load" will then be divided nearly equally between the two steps of the switch and the power factor will be raised, on both steps, to a value that precludes the formation of dangerous arcs. If the oil switch breaks a circuit in which the reactance is appreciably smaller than the resistance inserted by the switch, the major portion of the load will be thrown on to the first step and vice versa.

It is common practice to provide a resistance *r*, of as much as several hundred ohms to diminish the current rush on switching in a large transformer or for a similar purpose. If such values of the resistance are employed, the effect of a short-circuit on the low-tension side of the transformer will be to throw the whole load on to the first step of the switch. In such cases the arrangement shown in Fig. 1 may be adopted. The main contacts, *M*, are used only for current-carrying purposes, and are opened before the contacts *I* and *II* open in succession. The heavy load on the contacts *I* is divided between four breaks in series.

The most perfect method of switching off large loads would appear to be by successive insertion of resistance steps by a number of switches in series with one another.

Generators, Motors and Transformers

Air-Gap Polyphase Induction Motor.—F. T. CHAPMAN.—The first part of a long mathematical paper the object of which is to investigate the effects of the reaction of the rotor currents, and of the saturation of the magnetic circuit, on the distribution of the field in the air gap of an induction motor. From the data obtained, formulas are developed for the calculation of the air-gap dispersion and of the no-load current. In the present instalment the author begins to discuss the field produced by stator or rotor windings acting alone, the permeability being constant, and gives an analysis of the magnetic field due to polyphase currents in stationary windings. The article is to be continued.—London *Electrician*, Aug. 18, 1916.

Generation, Transmission and Distribution

Diesel Engines for Steam Plant Extensions.—An abstract of a paper read before the Diesel Engine Users' Association recently and containing a discussion of some of the problems met with in extending a comparatively inefficient generating station equipped with steam engines. From the figures given for three stations dealt with it was shown that the lower operating cost of a Diesel plant quickly offsets the higher annual charges for capital even though in one case the steam plant has an advantage of $1.60 per kilowatt, considering capital charges. A table giving comparative generating costs in the three stations before and after the installation of Diesel engines shows a reduction in the cost per unit generated of $0.72, $0.10, and $0.56 respectively, these figures being obtained in the face of rising fuel prices. Similarly, the over-all thermal efficiencies had shown an improvement in one case from 5 per cent to 22 per cent.—London *Elec. Eng'ing*, July 27, 1916.

Oil Circuit Breakers.—J. B. MCNEILL.—The author discusses briefly the theory of oil switch, its application and operation. Insulation and insulating materials are discussed. Special reference is also made to current-carrying capacity and the basis on which oil circuit breakers are being rated. The explanation of the actual arc kilovolt-ampere basis for rating oil circuit breakers advocated by the Westinghouse Electrical & Manufacturing Company are described in detail and formula and method of calculating circuit breakers rating given.—*Electric Journal*, August, 1916.

Tie Connection Between London Power Houses.—The tie connection between Fulham and Battersea power houses, in London, has been completed and is now in operation. This is a step in the proposed project of connecting electrical systems throughout Great Britain, wherever it is possible—London *Electrical Eng'ing*, July 27, 1916.

Electrostatic Neutral in the Two-Phase, Three-Wire System.—D. H. MOORE.—This article contains a great deal of important data that should be more generally known among engineers concerning the electrostatic neutral in two-phase, three-wire systems. The general conditions prevailing in such a system are discussed and the results of some most useful tests are given. The importance of the results obtained lie in the fact that a knowledge of them may lead to avoiding fatal accidents. Consideration was given to current flowing to ground; danger of making bodily contact with a circuit of large capacitance; resistance measurements of the human body; and interpretation of oscillograph tests are other subjects discussed.—*Gen. Elec. Rev.*, August, 1916.

Traction

Electric Locomotives for Interurban Service.—S. T. DODD.—In a long article the author discusses three typical classes of service and shows that any locomotive service may be looked on as a combination of these three types in varying proportions. He analyzes the conditions which limit the capacity of a locomotive in each of these three services and develops the corresponding formulæ which express the limiting weight of the train in each case. These formulæ define the tonnage capacity of a locomotive as accurately as is possible. The latter part of the article describes a number of small locomotives recently built and defines their tonnage capacity in terms of the formulae developed in the first part. Descriptions of locomotives used by the following companies are given: Transit Development Company, Brooklyn, N. Y.; Willamette Valley Southern Railway, Oregon City, Ore.; Chicago, Milwaukee & St. Paul Railway, Great Falls, Mont.; Fort Dodge (Iowa), Des Moines & Southern Railway; London & Port Stanley Railroad, Canada; Piedmont & Northern Railway Company, Charlotte, N. C.; University of Michigan, Ann Arbor, Mich.; Harlan & Hollingsworth Corporation, Wilmington, Del.; South Manchurian Railway, and Havana (Cuba) Central Railway —*Gen. Elec. Rev.*, August, 1916.

Regenerative Braking with Induction Motors.—H. G. JUNGK.—The author explains the method of regenerative braking of electrically driven trains. He explains that if a train is pulled by induction motors there will be a speed at which the force of the rotor flux, opposing the magnetizing flux, is just great enough to balance the losses in the motors and the force required to pull the train. Again, if some of the cars are uncoupled, the motor will have less work to do and will speed up a little. Railway induction motors are so designed that when running with the rotors short-circuited a small change in speed makes a big change in the opposing rotor flux. When the train starts down hill the force of

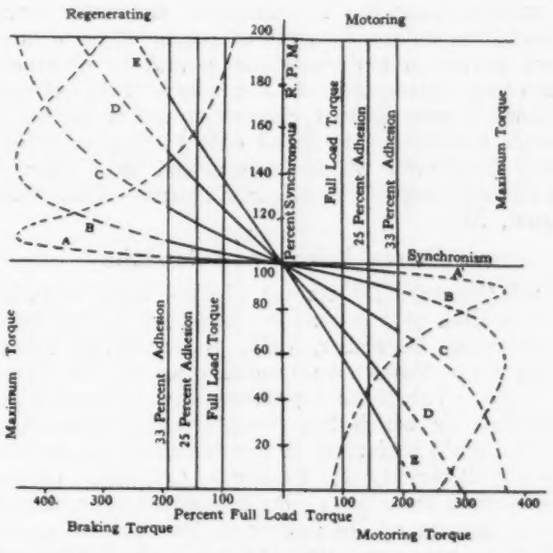


FIG. 2—RAILWAY INDUCTION MOTOR CHARACTERISTICS

A—Rotor short-circuited; *B*—rheostat resistance equals 3 × rotor resistance; *C*—rheostat resistance equals 9 × rotor resistance; *D*—rheostat resistance equals 19 × rotor resistance; *E*—rheostat resistance equals 29 × rotor resistance.

gravity will move the train ahead by its own weight, and will reduce the force required from the motors, the speed increasing until the motor runs free at synchronous speed. Beyond that point the train tends to drive the rotor faster than the rotating field. When this occurs the rotor conductors are again cutting the rotating magnetic field, since they are revolving faster than synchronous speed. The rotor flux set up opposes this tendency and tends to bring the rotor speed back to that of the magnetic field and, in so doing, resists the force of gravity acting to run the train downhill. The faster the train moves, the more resisting force the motor exerts until its opposing force equals that of the train, then the speed becomes constant. In Fig. 2, the relations of speed to torque are shown by curves, the full lines showing the working range of each curve. Curve *A* is that of the speed for a railway induction motor in which the rotor is short-circuited. Here a small change in speed brings about a large change in the torque of the motor, and likewise the same condition obtains in regenerating. It will be noted that in regenerating the maximum or pull-out torque is about 120 per cent of the maximum or pull-out torque in motoring, due to losses in this motor. Curves *B*, *C*, *D* and *E* show the effect of bringing the resistance of the rheostats into the rotor circuits. The rotor must run at a relatively

low speed to get maximum torque on curve *B*, while on curve *C* the maximum torque occurs when the motor is standing still. However, if this value of resistance were used the wheels would slip, because the torque is greater than the adhesion of the wheels to the track will take care of. Curve *E* is the best one for starting, for with this value of resistance in the rheostats the greatest possible torque is obtained just at start and is gradually reduced as the motor speeds up. By cutting out some of the resistance the torque curve changes to *D*, *C*, *B* and *A* respectively, and the motor gives greater torque at the higher speeds until the rotor is short-circuited. Then as the force of gravity on the train going down grade tends to run the motor faster than synchronism, the torque increases in the opposite direction, and tends to hold the speed down. In regenerating, as resistance is cut out, the resisting torque of the motor is reduced for the speed just above synchronism, and the train runs faster until the resisting motor torque and the effects of gravity balance, so that any train velocity above synchronism may be obtained by manipulating the resistance in the rotor circuits. Some of the unique features of regeneration with polyphase induction motors which cannot be obtained by steam locomotives are: 1. A constant train velocity up or down grade without change of motor connections. 2.—Air brakes are required only to stop or hold the train. 3.—Power which is developed by a train on a down grade helps to haul other trains.—*Elec. Journal*, August, 1916.

Wires, Wiring and Conduits

High-Pressure Submarine Cable.—Brief details on the operation of a submarine cable which has been in service since December, 1915, and carrying electrical energy from Sweden to Denmark across the Oresund are given. The cable represents the fulfillment of an agreement by which the South Swedish Power Company (Malmô) undertook to furnish energy to the North Seeland Electricity & Tramway Company (Hellrup, Copenhagen) from its power house at Lagan, about 50 miles northeast of Helsingborg. The submarine cable is about 3.4 miles in length and was made in nine pieces, each about 650 yd. long and 20 tons in gross weight (including the cable drum). Impregnated paper insulation is used between the three cores (each 70 sq. mm. in section), and profile-wire armoring is applied over the lead sheath. The cable operates normally at 35,000 volts, and was tested after manufacture to 87,500 volts. —London *Elec. Rev.*, July 21, 1916.

Units, Measurements and Instruments

Measurements of Very High Insulation Resistance in Cables.—J. FISCHER-HINNEN.—A very simple method of measuring insulation resistance of cables especially in cases where the galvanometer is not sufficiently sensitive is described. The idea is derived from Siemens' well-known method. In case an electrometer is connected to the coatings of a cable of capacity *C*—that is, charged to a voltage E_o, the charge will fall away according to the law $Q = Q_o e^{\frac{-t}{rC}}$ where Q_o is the original charge; $e = 2.718$, the logarithmic base; t is the time in seconds from the stopping of the charge; r = the insulation resistance. Therefore $r = t_1 \div [C \log (E_o/E_1)]$. The objection to this procedure is that a preliminary test is necessary to determine the capacity *C*, which at the moment is unknown. In order to meet this point it is suggested to proceed as follows: Let the above experiment be repeated with the addition of a shunt of known resistance (r_n) to the electrometer. Then the voltage will naturally fall off more quickly at a rate corresponding to the increased conductivity. Then it is only necessary to measure the time t_2 till the voltage has fallen by the requisite amount, and the insulation resistance is then given by the equation $r = r_n [(t_1/t_2)—1]$. Abstracted from *Elektrotechnische Zeitschrift*, Heft 8, 1916; in London *Electrician*, July 14, 1916.

Low-Resistance Standards.—C. V. DRYSDALE.—An illustrated article in which, after stating the essential features of a well-designed low-resistance standard, the author describes several such resistances having negligibly small time constants. The results of searching tests are given, and it appears that the tarnac alloy used in the construction of the resistance is identical with manganin. In conclusion it is claimed that as regards resistance alloy, British manufacturers are now able to rival German products, and it is hoped that in design and construction the new standards will prove to be a material advance upon the Reichsanstalt forms.—London *Electrician*, Aug. 11, 1916.

Telegraphy, Telephony and Signals

Electric Signaling with Bare Wires.—R. V. WHEELER and W. M. THORNTON.—In an abstract of a recent report on electric signaling with bare wires in English coal mines as regards the danger of ignition of inflammable gaseous mixtures by the break-flash of the signal wires, it is concluded by the authors as follows: (1) The bare-wire system of electrical signaling as commonly employed can be rendered quite secure from any danger of the ignition of inflammable gases by the break-flash at the signal wires or at the contacts of the signaling instruments. (2) In order to procure safety it is necessary, in the first place, to limit the battery power that is to be employed on any one circuit; and, in the second place, to insure that the signaling instrument, whether bell or relay, shall comply with certain requirements. (3) The present statutory voltage, 25, sets a reasonable limit to the battery power provided that wet Leclanché cells be used. Systems in which the battery used consists of dry primary cells or of secondary cells, or in which continuous or alternating-current generators are employed, could be rendered safe if, in addition to the use of anti-sparking devices embodied in the signaling instruments, sufficient non-inductive resistance were permanently included in the bell circuit. (4) The signaling instruments, bells or relays, should have flame-tight covers, and must be so constructed that when included in a circuit with a battery at 25 volts the break-flash produced when bare signal wires are separated after giving a signal is incapable of igniting an 8 per cent methane-air mixture. There is no difficulty in constructing either bells or relays to conform with these requirements.—*Iron & Coal Trades Review*, July 28, 1916.

Miscellaneous

Ministry of Science.—F. G. DONNAN.—The author expresses himself strongly in favor of the idea of a separate department of State to be called the "Ministry of Science." Some of the functions of this department are to establish national laboratories and "bureaus" for the purpose of undertaking extensive investigations; to guide the domestic and foreign policy of the cabinet by having ready at a moment's notice complete and detailed information concerning every question relating to science; to foster, endow and promote the teaching and investigation of science at the "Hochschulen" of the country by giving much larger grants of money to the scientific laboratories. The establishment of a great national bank is also suggested, whose special concern would be the fostering of new and old industries based on scientific method and scientific research.—London *Electrician*, July 7, 1916.

M. C. OSBORN

M. C. Osborn, who was recently elected president of the Northwest Electric Light & Power Association is a native of Michigan. He entered the public utility field in 1884 in Virginia City, Nev., where he operated the Virginia City Gas Company for twelve years. Leaving Nevada he went to California and was engaged by the then Yuba Power Company at Marysville. When that system was taken over by the present Pacific Gas & Electric Company, Mr. Osborn continued with the latter company as advance man in explaining the system and policy of the company to the numerous communities which were served by it. During that period he was elected president of the Pacific Coast Gas Association. Later he entered the service of the Denver Gas & Electric Light Company, leaving to become business manager and manager of the gas works of the Butte (Mont.) Electric & Power Company. There he remained for two years. In 1905 he entered the service of the Washington Water Power Company at Spokane, Wash., of which company he is now the commercial agent. Mr. Osborn has been quite active in all association matters in the Northwest.

Guy L. Bayley, who was chief of the mechanical and electrical departments of the Panama-Pacific International Exposition, has opened an office as consulting engineer in the First National Bank Building, San Francisco. Mr. Bayley is at present engaged in building a hydroelectric plant for the Department of the Interior in the Yosemite Valley on the Merced River.

A. Press has been appointed associate professor of electrical engineering at the University of Oklahoma, Norman. Mr. Press was for a number of years with the Allis-Chalmers Company in design work at Norwood, Ohio, and was afterward a member of the faculty of graduate studies of George Washington University, Washington, D. C. For two years prior to 1916 he was engaged in instructional work in England. Since returning to this country last November he has been doing special work for the patent department of the Western Electric Company, New York.

Men of the Industry

Changes in Personnel and Position— Biographical Notes

Dr. A. S. McAllister of New York has suffered a great bereavement in the death of his father, A. A. McAllister, who passed away at the family home in Covington, Va., on Sept. 4.

R. H. Roughen has been appointed district superintendent of the Beaver County Light Company, New Brighton, Pa., as successor to Sanford J. Magee, who has joined the New York force of J. G. White & Co. Mr. Roughen was formerly connected wiith the Duquesne Light Company of Pittsburgh, Pa.

Prof. Ellory B. Paine of the University of Illinois, who has spent the summer in the testing department of the Commonwealth Edison Company, has returned to Champaign to start the school year.

John T. Kester, who for eight years has been manager of the Noblesville (Ind.) Heat, Light & Power Company has resigned. Mr. Kester will remain with the company in an advisory capacity for a few months, but will undertake no active duties, his physician having advised a complete rest. Prior to his connection with the Noblesville company Mr. Kester was superintendent of the Southern Illinois Light & Power Company at Hillsboro, Ill. Under Mr. Kester's management the Noblesville Heat, Light & Power Company has been one of the most progressive companies in extending electric lighting and power service to farmers. In addition to its strictly rural business, the company has also obtained franchises in the smaller cities of Lapel, Westfield, Fishers, Cicero and Arcadia. Samuel B. Mott, who has been superintendent of the Noblesville company, will succeed Mr. Kester.

JOHN T. KESTER

SAM W. GREENLAND

Sam W. Greenland, who is president-elect of the Indiana Electric Light Association, was born at Clarion, Pa., in 1879. He was educated at the Pennsylvania Military College at Chester, Pa., and at the Pennsylvania State College, State College, Pa. Since his graduation he had been employed in the construction department of the American Telephone & Telegraph Company in the Pittsburgh district; in gas, electric and electric railway engineering with Robert W. Watson, consulting engineer, Harrisburg, Pa., and in central station operating work. Mr. Greenland was at one time general manager of the Columbus (Miss.) Railway, Light & Power Company. Later he took up the position he now holds, that of general manager of the Fort Wayne & Northern Indiana Traction Company. That company operates 220 miles of electric street and interurban railway in the vicinity of Fort Wayne, as well as electric light and power properties at Fort Wayne and at thirteen other interconnected Indiana towns.

Edward J. Cheney, who succeeds Edward McGuire as chief of the division of light, heat and power, Public Service Commission, New York, Second District, is a graduate of the University of Minnesota. After receiving the degree of electrical engineer, he joined the engineering staff of the General Electric Company at Schenectady, resigning to become assistant chief of the division which he now heads.

John L. Fay has resigned as superintendent of electric distribution of the Union Electric Light & Power Company, St. Louis, Mo., to engage in commercial engineering work. Mr. Fay has been prominent in the activities of the company, serving as president of the company section, National Electric Light Association, as chairman of the executive committee of the Employees' Mutual Benefit Association, as a director of the Utility Employees' Savings and Loan Association, and as chairman of the Central Safety Committee.

Edward McGuire of Buffalo, chief of the division of light, heat and power of the Public Service Commission, since 1913, has resigned.

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

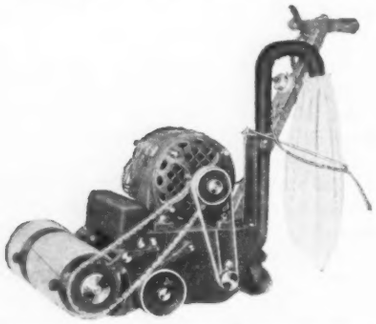
Motor-Operated Display Tables

Winfield H. Smith, 6 Lock Street, Buffalo, N. Y., has developed a line of advertising display tables, one of which is illustrated herewith, which are designed for electric operation. The tables are being used not only by the electrical trade for its own advertising purposes but also to non-electrical dealers. The device shown is equipped with machine-cut gears and ball bearings and can easily be run by a 1/30-hp. motor. Screw holes are provided so that a wooden top of any size desired may be added. The space occupied is 6.5 in. by 6.5 in. by 5.75 in. Forty-eight turns of the belt wheel are required to turn the table once. The diameters of the pulleys are 2 in., 3 in. and 4 in., and the pulleys may be equipped with a ⅛-in. or 3/16-in. round belt.

DISPLAY TABLE FOR MOTOR OPERATION

Floor Surfacing Machine

In the accompanying illustration a motor-operated floor sander is shown which has been developed for general floor sanding work. The motor operates a 12-in. sand roll which has been found large enough for large floor areas and small enough to permit convenient operation in cramped spaces, doing the work faster, cheaper and better than by hand.



SURFACER WITH EDGE SANDING ROLL

The machine is of simple and rugged design, being composed of but few parts. It is built on an interchangeable plan, insuring certainty that parts ordered for repairs will fit. It is claimed that with this machine from 4000 to 7000 sq. ft. (once over) of flooring per day can be surfaced. By the use of ball bearings, efficient electric motors and a well-balanced sanding roller, the machine consumes a small amount of energy. The operating cost does not exceed $1 per day for electric power, including sand paper, the manufacturer claims. A Century or Wagner 1-hp. motor for alternating current and a Crocker-Wheeler motor for direct current is used.

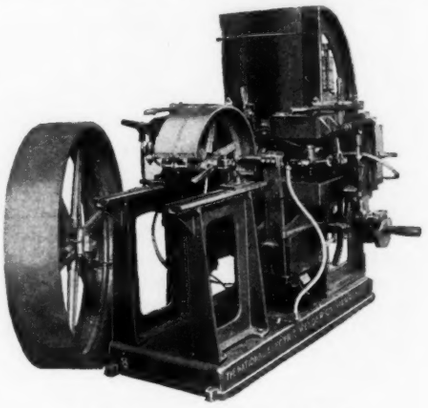
The sanding roll is 12 in. long and runs 725 r.p.m. It is constructed of a steel shell covered with high-grade felt, forming a cushion for the sand paper. An edge sanding roll 4½ in. wide is provided which is detachable and used only for surfacing the edge of the floor, close to the wall.

A vacuum cleaner placed directly behind the sanding roll gathers the particles of dust and carries it up through a pipe to a sack near the operating handle. This sanding machine is known as the "American Universal" and is made by the American Floor Surfacing Machine Company, 518 South St. Clair Street, Toledo, Ohio.

An Electric Welder for Round Work

In the accompanying illustration an electric welder is shown which will take circular work ranging from 12 in. to 60 in. without affecting its automatic features of operation. This welder has been built by the National Electric Welder Company of Warren, Ohio, for welding pulley fillers to the rims. In addition to its unusual range of automatic operation, the machine is notable, it is said, for the small number of moving parts and the simplicity of the mechanical principles on which these parts operate. Two complete and separate welding equipments are provided, one on each side of the center of the pulley and each makes sixty welds per minute with a motor drive and automatic switch. The welding mechanisms move away from each other so as to give a 12-in. clearance between the welding points.

These welding points are water-cooled and will operate within a space of 2.5-in. radial from the center of the arbor. Feeding and stopping are automatic, the feed device being adjustable from 0.5 in. between welds up to 3 in. or more as desired. The stops will automatically trip and stop the machine when the separation strip on the pulley is reached. An adjustable mandrel gives the desired distances between centers and faces of the work. This appliance occupies a floor space of 50 in. by 5.5 ft. and weighs approximately 3500 lb. It is pointed out that this is rather low when the size of the work the machine will handle is considered.



A SPECIAL ELECTRIC WELDER

Low-Voltage Magnet Charger and Meter

A magnet charger, designed to operate from an ordinary 6-volt storage battery, or from a group of five or six dry cells, is now made by the Electric Equipment Company, 315 West Twelfth Street, Los Angeles, Cal. The principal drawback to a charging outfit, the manufacturer points out, has been the absence of a 110-volt direct-current service and the expense of a suitable charging coil. The magnet charger referred to is compact in design and adjustable to any size magnet. The device consists essentially of two coils so arranged as to permit the poles of a horseshoe magnet to be inserted in

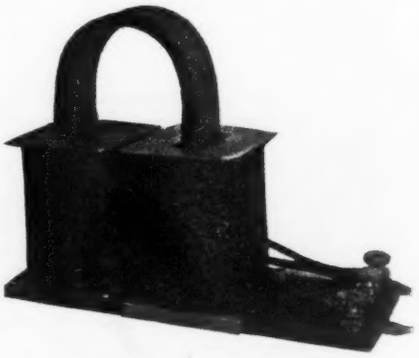


FIG. 1—MAGNET CHARGER WITH MAGNET INSERTED

them. The coils are mounted on a suitable base with terminal posts for connection to a direct-current circuit.

The outfit consists of the charger and

FIG. 2 — MAGNET METER USED WITH MAGNET CHARGER

a magnet meter to measure the strength of the magnets to be charged. The meter and charger is shown herewith.

Pole Guy Anchor

The "Faultless" pole guy anchor shown herewith is so designed that it depends only slightly upon the soil which has been disturbed in its installation to hold it permanently where it is put. The ribbed baseplate is of ample strength to withstand the weight of the displaced soil and to form a backing for the blades when spread. The malleable-iron blades are of such construction that when opened, their strength is sufficient to withstand without bending any strain that can be placed upon them within the tensile strength of the jackscrew used to expand them. The eye for attaching the guys is found upon the jackscrew rod. The anchors are made in four sizes, as follows: No. 1 and No. 2 (two-blade) types are intended for light and heavy storm guying, or farm work, such as guying silos, fences, etc. No. 3 (three-blade) and No. 4 (four-blade) types are designed for the heavy strains encountered in dead-end, cable and all classes of work where firm anchorage is an absolute necessity. They are a dependable substitute, it is pointed out, for dead men, slugs, etc., and much cheaper.

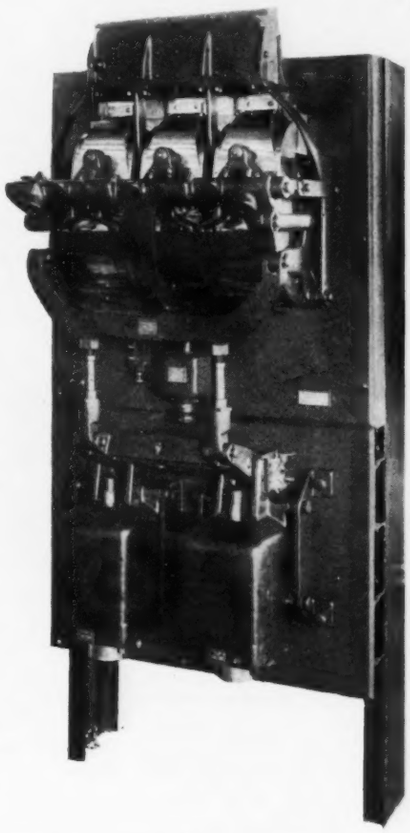
The No. 1 anchor has a 6-in. spread

GUY ANCHOR WITH BLADES SPREAD

when closed and 15-in. spread when open and holding strain up to 4000 lb.; the No. 2 anchor on 8-in. spread when closed and 18-in. spread when open and a holding strain up to 7500 lb.; the No. 3 anchor on 8-in. spread when closed and 18-in. spread when open and a holding strain up to 12,500 lb.; the No. 4 anchor a 12-in. spread when closed and 24-in. spread when open and a holding strain up to 18,000 lb. The anchor is being placed on the market by the Faultless Anchor Company, Fostoria, Ohio.

20,000-Amp. Direct-Current Circuit Breaker

The direct-current circuit breaker, shown herewith, is the most recent solenoid-operated type of circuit breaker developed by the General Electric Company, Schenectady, N. Y., for controlling direct-current circuits of unusually high capacity. The normal continuous



20,000-AMP., 500-VOLT DIRECT-CURRENT SINGLE-POLE SOLENOID-OPERATED CIRCUIT BREAKER

rating is 20,000 amp. This circuit breaker is one of four of the same capacity built for the Aluminum Company of America for installation at Massena, N. Y. The closing and opening movements under normal conditions are controlled by a single-pole double-throw control switch mounted some distance away from the breaker on the switchboard or in other convenient location. On overload or short-circuit the breaker opens automatically by means of a direct-acting trip. The breaker is mounted on a 2.5-in. slate panel. The solenoid mechanism is supported by a steel base. The use of solenoid-operated and other types of distant-controlled circuit breakers simplifies station wiring, and reduces length of main cables.

Centrifugal Separator Vacuum Cleaners

A sanitary vacuum cleaner, shown in Fig. 1, is a recent development by the United Vacuum Appliance Company,

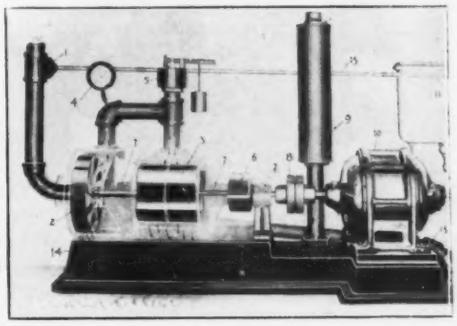


FIG. 1—PHANTOM VIEW OF COMPLETE UNIT

Connersville, Ind. A distinctive feature of this machine, the manufacturer points out, is its dirt separator. Dirt is separated from the air by centrifugal force in such a way that the air is drawn out through the exhaust and the dirt discharged with water into the sewer without pressure, during the entire time the machine is in operation. By this means, it is pointed out, the use of a screen is unnecessary, and the need of a collecting tank is done away with. A cross-section of the vacuum producer is shown in Fig. 2 and the rotor of the centrifugal separator in Fib. 3.

The centrifugal type of separator has only one valve. It is a simple swing check valve which opens just wide enough to discharge the water and the dirt forced against it by the rotor of the separator. There is a small, continuous spray of clear water entering the washing chamber at all times, so that the instant the tool is lifted from the floor, this water cleans the rotor and the pipe line. This spray is drawn into the washing chamber from a box when the vacuum producer starts, and ceases to flow as soon as the vacuum drops to zero on shutting down the machine. The tank is kept full of water by means of a ball float shutting off the city water supply when the spray pipe ceases to draw water from the box. The water and dirt are handled under high veloci-

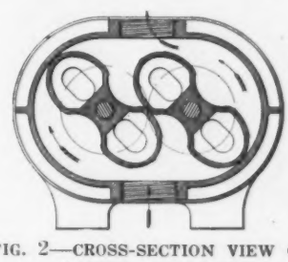


FIG. 2—CROSS-SECTION VIEW OF VACUUM PRODUCER

ties, thereby preventing any deposits in the sewer line, it is claimed.

One interesting piece of work for which these machines are adapted, it is pointed out, is the removal of soap suds and dirty water from carpets, rugs or bare floors which have just been

scrubbed. The machines have been installed in residences, public buildings, commercial cleaning establishments and hospitals.

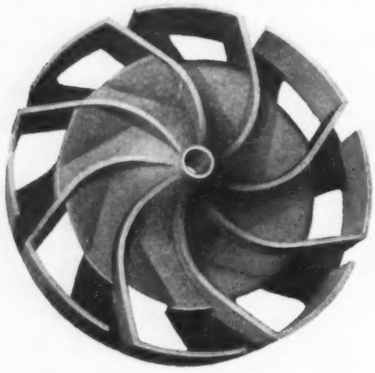
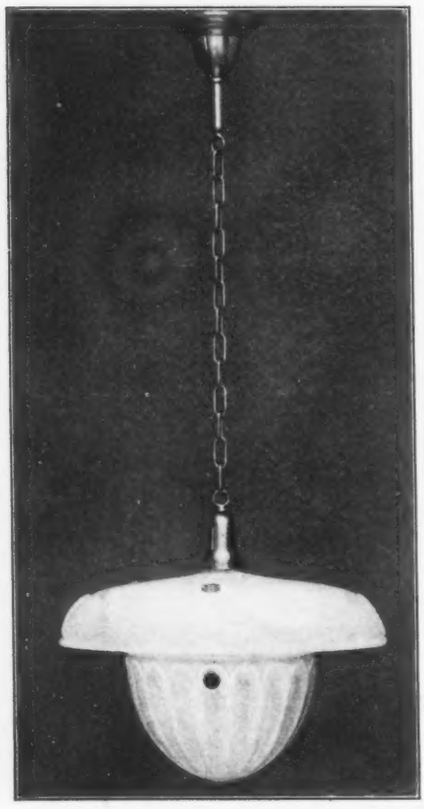


FIG. 3—CENTRIFUGAL SEPARATOR MOTOR

The one-sweeper machines occupy a floor space of about 20 in. by 48 in. and at no point are higher than 2 ft. above the floor level. The larger machines require but little additional floor space, being compactly assembled. The weights range from 600 lb. for the cleaner of one-sweeper capacity to about 2000 lb. for a complete four-sweeper unit with motor, call mounted to a common cast-iron bedplate.

High-Efficiency Lighting Unit

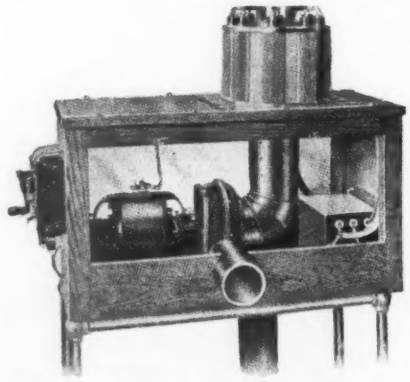
The diffusing glass lighting unit shown herewith is made of "Cora" glassware and is designed especially for use with nitrogen-filled lamps. The unit causes the light to be diffused in a soft glow, and is particularly adapted for lighting stores, offices and public buildings. It is of pleasing Gothic design, as shown, and is being made in the three following sizes suitable for use with lamps rated at from 60 watts to 500 watts: 11-in. reflector with 6.5-in. bowl, 13-in. reflector with 8-in. bowl and 17-in. reflector with 10-in. bowl. This double-efficiency fixture, as it is called, is being marketed by the Consolidated Lamp & Glass Company, Coraopolis, Pa.



DIFFUSING GLASS LIGHTING FIXTURE

Ozone Machine

The construction of the ozone machine shown herewith is based upon United States patent No. 1,063,167 and will soon be placed on the market by S. G. Hunter, 1117 Twenty-second Street, Des Moines, Iowa. The ozone-producing device consists of a main frame of metal (preferably aluminum) constructed with annular end pieces which are provided with slots extending inwardly from the periphery of the rings toward their centers. These annular end pieces or rings are held together by longitudinal bars. A series

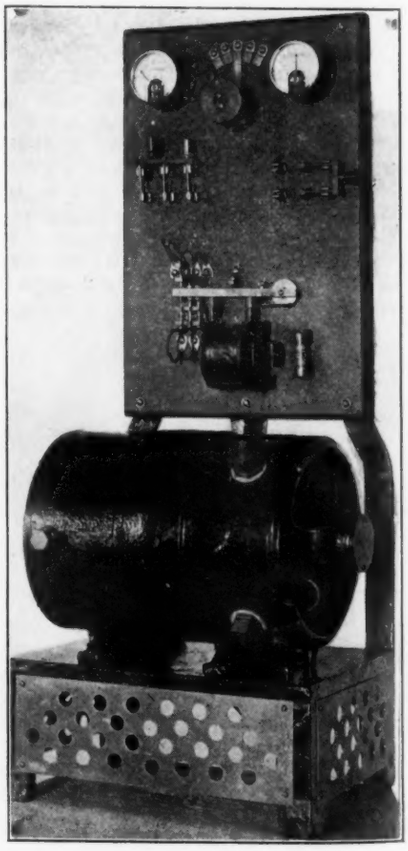


OZONE MACHINE FOR ALTERNATING OR DIRECT CURRENT

of comb-like electrodes are arranged to fit in the slots. The electrodes consist of a strip of conducting material, and have a series of laterally extending teeth. When these electrodes are placed in the slots the ends of the teeth will lie at the same distance from the center of the rings. The electrodes are held in place by means of rings which fit over the annular end pieces. The dielectric is a thin glass tube. Within the tube, at a short distance from each end, is an insulating washer. On each end of the tube is a cap made of insulating material. Between the washers the tube is filled with a finely-powdered conducting material. A metal conducting rod extends through the tube from end to end with the ends of the rod threaded to receive nuts which hold the caps in place. The rod forms one terminal, to which one pole of a transformer is attached, the other pole being connected with the frame which holds the electrodes. The dielectric prevents sparking between the teeth and the electrodes and the conducting material, but it permits a static discharge through the glass in the form of a glow. The air is passed either through the slots of the comb-like electrodes or directly through the air gap between the electrodes and the glass dielectric; in either case the air is brought under the immediate influence of the electric glow. The air is drawn in by the blower, shown in the center of the picture, and forced out into the room through a pipe.

Rectifier, with Synchronous Commutation

The new "Imperial" rectifier shown in the accompanying illustration is designed to change the alternating current to direct current by synchronous commutation. A rectifying commutator is driven at synchronous speed by a new type of synchronous motor, which requires no direct current for its operation, and which is so constructed that it needs no auxiliary device, the manufacturer points out, to allow for charges in current, voltage or frequency. The direct current voltage steps are arranged to charge three, six, nine, twelve or fifteen cells at a starting rate of from 10 amp. to 12 amp., and is automatically tapered to 4 amp. or 5 amp. as a finishing charge. The rectifier can be installed in any motion-picture booth, as it occupies a floor space of 10 in. by 14 in. while it is 36 in. high. According to assertions of the manufacturer, the Imperial Electrical Company, Union City, Ind., the efficiency of the outfit is from 80 per cent to 90 per cent.



SYNCHRONOUS RECTIFIER MOTOR

NEWS OF THE INDUSTRY

A Review of Activities in the Electrical Manufacturing, Selling and Central-Station Fields

Los Angeles Edison Situation

Since the Railroad Commission of California handed down its decision establishing a value for condemnation purposes on the Los Angeles distributing system of the Southern California Edison Co., which the city of Los Angeles proposes to acquire, the officials of the city have been holding conferences to determine what course of action it is practicable for them to take. The commission established a valuation of the property in question of $6,328,000.

To acquire the property on this basis the city would have to make another bond issue and the last election in Los Angeles showed that additional bond issues were unpopular with the taxpayers and voters. It is claimed that of the $4,700,000 proceeds of power bonds the city has already committed itself on actual contracts or has actually expended a sum of $700,000 at the very lowest figure. Furthermore, the commission's decision established a value as of June 30, 1915, and since then the Edison Co. has spent about $200,000 which would be added to the value in actual condemnation proceedings.

There has been some talk among city officials of applying for a rehearing on a point of law, in an effort to obtain a new decision somewhat along the line of Commissioner Edgerton's dissenting opinion. At the present time considerable importance seems to be attached to an informal suggestion of Boyle Workman, city public service commissioner, that the city should now proceed on the revised plan of acquiring the city distributing systems of the three companies operating in Los Angeles and thus creating a monopoly on local service to the public.

It is understood that if the city should develop all the power available from its Owens River project it would only have about half enough to serve the population of Los Angeles, and it now has only a little more than half the money required to purchase the Edison distributing system, which would still leave it with competition. The Workman plan would make the city a purchaser of power from existing companies on a wholesale basis.

New Officers of Association of Edison Illuminating Companies

At the closing meeting of the convention of the Association of Edison Illuminating Companies, held at Hot Springs, Va., and reported in the ELECTRICAL WORLD week before last, a banquet was given to members and guests present. About 250 attended, with President Wells presiding. Following the dinner, officers for 1916 and 1917 were elected. The complete list is as follows:

President, Peter Junkersfeld, Chicago; vice-president, L. L. Elden, Boston; secretary, George C. Holberton, San Francisco, and treasurer, W. W. Freeman, Cincinnati.

Executive committee: Peter Junkersfeld, chairman, Chicago; Charles L. Edgar, Boston; L. L. Elden, Boston; W. W. Freeman, Cincinnati; George C. Holberton, San Francisco; Samuel Insull, Chicago; John W. Lieb, New York; Joseph B. McCall, Philadelphia; Walter F. Wells, Brooklyn.

Mr. Junkersfeld, the newly-elected president, was escorted to the chair by John W. Lieb of New York and Louis A. Ferguson of Chicago. He expressed his thanks for the new office in a felicitous speech, and asked especially for the co-operation of all members to forward the work of an association whose traditions linked it with the best in the industry. Guests and members then assembled in the ballroom at the Homestead Hotel, and with W. W. Freeman of Cincinnati as official announcer the prizes for the various contests held during the week were awarded. A surprise for F. H. Gale of Schenectady followed the general distribution of prizes, when Mr. Freeman announced that the ladies present, in appreciation of Mr. Gale's untiring efforts to make their stay pleasant, had presented him with a special gift.

Dr. Rosa of Bureau of Standards and President Wagner of N. E. L. A. Exchange Viewpoints on Electrical Safety Code

The National Electrical Safety Code prepared by the Bureau of Standards of the Department of Commerce at Washington is about to be published for distribution to state commissions and electric central stations. It is understood that the Bureau of Standards will suggest to each commissioner that it ask the central stations in its state to report on the local effect of the application of the code. It is not intended that the code shall be inforced within a year and that it shall be subject to modifications during that period and thereafter. Accounts of the various conferences on the development of the code between representatives of the utilities and other branches of the industry interested, have been presented in the ELECTRICAL WORLD in the following issues: Oct. 30, 1915, Nov. 6, 1915, and May 4, 1916. The last conference was held in Chicago on May 29, 1916, and the accounts of that meeting were printed in the June 3 number of the ELECTRICAL WORLD.

At this final conference exceptions to the code were taken by representatives of the committee of the National Electric Light Association. The following letters, exchanged between H. A. Wagner, president of the National Electric Light Association, and Dr. E. B. Rosa, chief physicist of the Bureau of Standards, set forth the viewpoints of the association and the Bureau of Standards on the code.—EDITOR'S NOTE.

NATIONAL ELECTRIC LIGHT ASSOCIATION
BALTIMORE, MD., Aug. 5, 1916.

DR. E. B. ROSA,
Chief Physicist, Bureau of Standards,
Department of Commerce, Washington, D. C.

DEAR SIR:

Your letter of June 12, addressed to E. W. Lloyd, president of the National Electric Light Association, came to me as his successor after July 1 for my attention. I have deferred replying to your communication until I have had full opportunity to confer with those who have been representing the National Electric Light Association in the various conferences with the bureau and have also taken the occasion to talk with you personally to get your point of view, and have consulted others vitally interested in the welfare of the National Electric Light Association and familiar with this situation.

The proposed National Electrical Safety Code has been prepared, discussed and revised by the Bureau of Standards with the fullest co-operation of the engineers of many of the public utilities and other interests concerned in the transmission and distribution of electricity. It has been frankly admitted by

many of these engineers that, as a set of engineering specifications and rules to establish standards for a high class of electrical installation, the code is more comprehensive and complete than any set of rules so far advanced. It is frankly anticipated that there might be many situations where the rules could not and should not apply and where any attempt to enforce them might work great hardship and damage both to a public service utility and that part of the public using its service.

It is therefore respectfully suggested and strongly urged that the rules of the bureau when promulgated should be accompanied with a distinct statement to the effect in substance that they are not claimed to be of universal application but are rather a standard of practice to which all companies should approach as nearly and as rapidly as practicable, and that the failure in any given case, fully and literally to comply with all their requirements, is not to be taken as evidence of bad practice, without consideration of the special circumstances and conditions in the particular case in question.

It should be evident that the preparation and codification of the rules was largely an engineering problem which could be and was frankly discussed by the engineers of utilities but that, on the other hand, the adoption and use of the rules would become a matter of public policy which the engineers were not authorized and did not make any material attempt to consider.

Up to the time of the general conference of the Bureau in Chicago, on May 29 and 30 last, the conferences had been devoted principally to the engineering aspects of the code, and with some qualifications and exceptions the engineers of the utilities and the bureau were fairly in accord as to the general character and scope of the rules, although not agreeing with certain specific items. When, however, the general conference was called, the bureau asked for an expression "on the general adequacy and practicability of the code and on its readiness for introduction on trial," thereby changing the issue from one of electrical engineering to one of public policy.

As I understand and interpret the criticisms of the members of the committee of the National Electric Light Association, made at the general conference, these were directed particularly to the question of the code's readiness for introduction on trial and as to what the proposed introduction and trial might involve and the possible injustice which such trial might work upon many utilities, particularly when the interpretation and application of the rules should get beyond the control of the bureau, as they necessarily would. This involved the question of public policy and intervention in local situations and issues which no committee of the National Electric Light Association is empowered in any way to commit and give the assent of its membership to.

The committee went to the general conference at Chicago with the full understanding that they would neither approve nor indorse the code for the association. The situation was such that while practically all the electrical utilities are in sympathy with regulation within its legitimate scope, it was the belief of many that the enforcement of this code would go further than regulation and seriously invade the field of operation. To take out of the hands of the officials of the utility companies questions of managament might deprive the public and investors of the benefits of private initiative and official responsibility upon which they have a right to and do insist.

The bureau's suggestion that these rules might receive tentative adoption for trial by states and municipalities might not and probably would not be carried out in the same spirit and with the same broadminded attitude which the bureau holds. When the rules are once printed and sent out broadcast they will be entirely out of your hands, and yet, bearing the imprint of the Bureau of Standards, Department of Commerce, they will have great weight and authority.

While our committee frankly gave your organization credit for the immense amount of conscientious work in the production of an unusually complete set of specifications covering construction and operation of electric installations, they took the stand that the owners of electric utilities in the last analyses must be the ones to decide whether or not they could, in actual practice, live under the proposed rules. I am sorry, however, that the committee took the attitude of emphatically stating its *disapproval* of the code, in seeking to show that it could not *approve* of a proposed *use* of the code which would necessarily result in the loss by the bureau of any power whatever to control its interpretation and application. You had stated for the bureau that you did not ask the National Electric Light Association, or its committee, to approve the code, but it was the committee's fear that unless they were clearly on record as not approving it some of our member companies might readily be charged, when in litigation, with being a party to the code, and therefore indorsing it.

Finally, and without seeking by further discussion to justify the attitude of our committee at the Chicago conference, or of the association as being responsible for its action, I want to assure you of our great appreciation of the motives and highly efficient work of the bureau and of our desire to continue to co-operate with you in the further consideration of the code and its applications to the fullest extent possible while conserving the rights and reasonable interests of the association's utility company members. A committee will be appointed to continue to co-operate with you and to meet with your representatives for further consideration of the code at such times and in such ways as may be agreed upon.

We should appreciate your suggestions for the continuance of the work in the manner best suited to promote the safe and reasonable interests of the public, the electric utilities and their employees.

With kind personal regards, I am
Yours very truly,
H. A. Wagner, President.

DEPARTMENT OF COMMERCE
Bureau of Standards
Washington, D. C., Aug. 16, 1916.

Mr. Herbert A. Wagner,
President, National Electric Light Association,
100 West Lexington Street,
Baltimore, Md.

My Dear Mr. Wagner:

Your letter of Aug. 5 came during my absence from the bureau. Regarding the matter of making it clear that the rules are not intended to be universally applicable in all particulars nor to be rigidly enforced at once, we feel that our introductory statement, together with the plan and scope of the rules as given at the beginning of each of the four parts and the rules themselves, make that very clear indeed. So much has been said about this in our discussions and so much attention has been given to this matter in the formulation of the rules, that I do not see how anyone can possibly misunderstand if he has read the code carefully.

We feel that undue stress has been laid upon the possibility that public service commissions and other public authorities will not administer the code in an intelligent and reasonable way. The engineers of the Bureau of Standards have discussed this matter with a good many commissions and we have not found a single commission that has shown the slightest disposition to interpret the code in an unreasonable manner, or to ignore general practice or the interpretation of other commissions, or the explanations or interpretation of the Bureau of Standards. Of course, particular instances of unfair requirements will arise; but utility companies know what to do in such cases. Regulation of public utilities would be impossible if it had to be shown in advance that no commission or engineer of a commission or other administrative body would ever make a mistake.

It is proposed to adopt the code for use *on trial* in order to develop and perfect it by the experimental method.

You speak of the committee's anxiety concerning "the possible injustice which such trial might work upon many utilities." The purpose of a trial use is (1) to permit utilities and others concerned as well as administrators to become familiar with the code, (2) to demonstrate its usefulness and practicability, and (3) to ascertain whether the utilities find it a hardship to comply with any of the rules; and if so to remove the difficulty. But it certainly is not intended that companies will be obliged to comply with the rules strictly before ascertaining whether they can do so reasonably. No company could put such a code into effect completely at once. It will take many weeks and in some cases months to become entirely familiar with all phases of the code and consider what must be done to meet the letter and spirit of the rules. If a company does first the things that are most obvious and most readily done, and gradually takes up the more difficult questions, it will be prepared sooner or later to report to a state commission or other administrative body in what respects it cannot reasonably comply with the code. The *trial* is to find out such things in order that the code may be revised and made entirely free from unreasonable requirements, if it contains any now. The question of whether the various rules contained in the code could be complied with in practice was considered at every stage of the development of the code; these rules indeed being usually an expression of good present practice as given us by practical operating engineers. Having put the code into the best form possible after three years of study and discussion, it now remains to try it out in practice, and improve it further as experience shows how. In order that this may be done without embarrassment we proposed that the code be adopted on trial, and if we can have the full and cordial co-operation of all the utility companies we feel that this program can be carried out successfully.

I appreciate very much the cordial tone of your letter and your expression of appreciation of the work of the bureau. Permit me to say that the bureau feels greatly indebted to the scores of engineers, many of whom are members of your association, who have co-operated with us so fully in the past, and whose expressions of sympathy and good will have been a great encouragement in the work.

When the members of the new committee have been appointed we shall hope to learn their names, and shall be glad to meet them at their convenience to discuss the question of further co-operation.

With kind personal regards, I am,
Yours sincerely,
E. B. Rosa, Chief Physicist.

New York Electrical Show Plans

Plans have been perfected for the New York Electrical Show and arrangements have been made for many special features of public interest. The show this year will be held at the Grand Central Palace from Oct. 11 to 21.

The keynote of the exposition of 1916 will be the improvement of working conditions in factories and shops. It is a generally conceded fact that electricity has accomplished more than any other single agency in bettering labor conditions in every branch of industry. Individual motor drive on machinery, in addition to being far more efficient, has eliminated dangerous belting which served chiefly to stir up dust for workers to breathe. Electrically driven blowers and ventilators now carry away noxious fumes and vapors and death-dealing dusts. The method and means by which these and many other healthful and sanitary things are accomplished will be shown by working exhibits.

Electric vehicles, both pleasure cars and commercial types, as well as the various accessories, will hold a prominent place. As in the past the automobile side of the exposition will represent the latest developments and the last word of progress in electrical vehicle manufacture. A test run of unusual interest is now being planned to be held during the exposition.

The use of electricity in national defense and in modern warfare will be shown by the War and Navy Departments. Under the direction of the Navy Department the latest type of hydroplane with a 35-ft. spread of wings will be exhibited. The Navy exhibit will also include a 5-kw. wireless sending and receiving equipment such as is used on a modern battleship, models of the latest type of electrical equipment used in the Navy Yard, a demonstration of the interior wiring for communication and fire control of a modern battleship, which will be constructed and operated by students of the electrical class of the New York Navy Yard, and a model of the old frigate Constitution. The War Department exhibit will be prepared by the signal corps of the Department of the East of the Army, and will consist of all electrical communication apparatus used by a modern army in the field, including wireless, telegraph, telephone, fire control communication set, and a radio tractor set.

The dairy industry will be represented by a feature exhibit the object of which will be to show that with the modern application of electricity in the dairy a considerable economy in labor and in money can be effected and that the milk itself need not be exposed to the air at any time, not even during the process of milking, until the bottle is opened by the consumer in his own home.

A modern motor-driven bakery in full operation will be one of the features of the exposition. Every process of bread and cake making will be carried on under the most ideal and sanitary conditions, and with the latest and most improved devices. Through the co-operation of the New York City Board of Education students of the Murray Hill Vocational School will have charge of operating the bakery.

It is the purpose of the Electrical Exposition to record and to present in an interesting manner the advancement which electricity has made in every industry. One field in which its progress has been marked and has tended toward accomplishing greater efficiency is that of the modern laundry. The necessity for economy in space and individual drive has shown that it is an ideal place for the electric motor. A completely equipped electrical laundry will be shown.

A comprehensive exhibit of the bureau of home economics of the New York Edison Company is planned to show in a practical and scientific manner how the woman of to-day may conserve her time, health and energy by using modern electrical household devices. Every electrical invention for use in the home will be assembled for inspection and for trial. In conjunction with this exhibit there will be a laboratory where both technical and practical tests will be made of laundry, kitchen, pantry, dining room and general household devices and equipment by people especially trained in this work. There will also be a large living room where the smaller devices may be seen at any hour of the day or evening during the exposition in actual operation. Tea will be served here every afternoon. One of the features of the exhibit will be a series of scientific tests made by Dr. Langworthy's calorimeter, which will show the vast contrast between the expenditure of energy in using the old-fashioned household devices and the modern electrical labor-saving equipment. The broom will be contrasted with the vacuum cleaner, the electric iron and the one heated on the stove, the old-fashioned wash tub and hand wringer with the modern electrical washing machine and wringer, the electric dish washer with the old dish pan in the sink. The plans also include a large government canning plant, electrically equipped and in full operation, where the modern methods of canning, approved by the government experts, can be seen.

Public Service Commission News

Indiana Commission

The Public Service Commission has just handed down an order interpreting a part of the Indiana utility law with regard to the extent of the jurisdiction of the commission, when proper officers of a town which has a contract with an electrical utility have designated points on the town streets at which it is desired to have street lights. Acting on a petition of Paul Ward et al. in the town of Reynolds against the Interstate Public Service Company, the commission recommended that a street lamp be placed close to a church designated in the petition, but did not order the installation of such a lamp. The company contended that its lamps in the town had been placed at the points designated by the proper town officials. The commission, in its order, says it has no jurisdiction to say where such lamps shall be installed, unless the designations of the proper town officials are unreasonable. In the case of the church at Reynolds the action of the town officials had not been unreasonable, the commission ruled, but it recommended that the lamp be placed where desired by the petitioners, because it would supply light to a large neighborhood.

Pennsylvania Commission

The Public Service Commission has denied the application of the Philadelphia Electric Company for permission to lease the unused conduit system of the Keystone Telephone Company for a period of twenty-one years dating from Jan. 1, 1915, and privilege of further extension of fifteen years, at an annual rental of 4 cents per foot of conduit space actually occupied, with minimum payment of $25,000 the first year and increase of $12,500 per year thereafter up to 1921, at which time the rental for the balance of the term of the lease would be at the rate of not less than $100,000 per annum.

In refusing permission, the commission says that the rental exacted would prove a hardship on the public, the patrons of the electric company, and that the serious error made in arranging the contract was the omission of a maximum annual rental upon a reasonable basis of computation. The commission also upholds the protest entered by the city upon two points: (1) The amount of annual rental per foot specified, and (2) the failure of the lease to stipulate within what period of years the overhead wires of the electric company would be placed underground. In its decision, the commission says:

"No one can say how many of the 10,000,000 ft. of conduit available will be occupied by the electric company, but it is not entirely inconceivable that the whole number may be used, in which event the electric company will be required to pay $400,000 out of its gross revenues, or more than 13 per cent on a reasonable valuation of the underground system. Another material oversight in the proposed contract is the failure to provide for an allowance or reduction of the minimum annual rental if and to the extent the telephone company itself will use the ducts. The contract is too highly speculative to meet the commendation of the commission; there may never be a single foot of the conduits used but, nevertheless, there must be paid annually $100,000; there may be a great amount used, possibly enough to absorb $400,000 per year, perhaps twice as much as a fair return upon the investment. In either event the public, the patrons of the electric company, will be mulcted for a long period of years. Any waste on the part of the utility enterprise necessarily reacts upon the consumer either in high rates or poor service."

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Cleveland Voters Will Pass Upon $1,750,000 Bond Issue for Addition to Municipal Plant.—The City Council at Cleveland, by unanimous vote, last week adopted a resolution providing for the submission of a bond issue of $1,750,000 to the voters at the November election, the proceeds to be used in enlarging and extending the municipal light plant.

Efficiency Conference in November.—The Efficiency Society is planning an open conference, to be held in New York City on Nov. 16, 17 and 18. The program calls for five sessions, as follows: First session—foreign conditions and their prophecy; second session—analysis of the present industrial and commercial situation in the United States as a basis for the third and fourth sessions; third session—survey of the future; fourth session—survey of the future continued; fifth session—development of a plan of action.

Consumers Power to Build New Plant.—The Consumers Power Company, Jackson, Mo., is starting operations on the construction of a dam thirty miles from Manistee on the Manistee River. The power generated will be fed over high-tension wires to the company's dam at Croton, and thence to Grand Rapids and Muskegon for distribution. The new dam will increase the company's capacity from 65,000 hp. to 87,000 hp. Owing to the increasing demand for cheap electric power for industrial purposes, the construction of the new dam is being started at a time when labor and material conditions are not the most favorable.

Flow of Water in Wood-Stave Pipe.—"The Flow of Water in Wood-Stave Pipe" is the title of a new professional paper of the United States Department of Agriculture, department bulletin No. 376, by Fred C. Scobey, irrigation engineer. The bulletin is based upon the results obtained through a large number of experiments on the flow of water in wood-stave pipes ranging from 8 in. to 13.5 ft. in diameter. The work also includes the collection and analysis of available records of all previous experiments of a similar character. From the results of all experiments made, there has been deduced a new set of formulas for the flow of water in stave pipes, which is presented in the bulletin. The bulletin is highly technical in character, and its distribution is limited to engineers and others concerned with the use of wood pipe for conveying water for irrigation, power, municipal, mining and similar purposes. Application for the bulletin should be addressed to the United States Department of Agriculture, Washington, D. C.

Cleveland Municipal Plant's Capacity Sold.—In an announcement made on Sept. 2 Public Utilities Director Farrell said that 5000 applications for service have been filed with the Cleveland Municipal Plant that cannot be accepted at this time, because the capacity of the plant is now sold up. He also announced that the plant has accumulated a surplus above cost of operation of $118,000 so far this year and that it now has 17,000 active accounts.

Contractors Handicapped by Supplies Situation.—Electrical contractors of Louisville are complaining about being handicapped on jobs by failure of other contractors to make the time they should. Inability to obtain the material necessary is the invariable cause of the delays, and sometimes the electrical contractors themselves are hampered by inability to get the supplies they need. One leading Louisville contractor instanced a time-limit job on which he is going to be penalized for the simple reason that deliveries he claims were promised him are not being made.

Dallas Straw Vote to Be Taken During Coming Week.—To settle the controversy in regard to the valuation to be placed on the properties of the Dallas (Tex.) Electric Company as a basis for the granting of new franchises, a straw vote will be taken by mail during the coming week. In case the majority favors the larger valuation of $8,500,000 and the franchises are granted on that basis, the new owners agree to spend $5,000,000 in improvements and extensions on the properties, including two new interurban railways. A voluntary reduction in the electric lighting rate to 7 cents a kilowatt-hour is promised also.

Foreign Trade Course at University of Cincinnati.—A course has been provided for at the University of Cincinnati for the ensuing school year by the Cincinnatti Chamber of Commerce, covering the practical details of handling foreign business. The increasing need for knowledge of this sort led to the establishment of the course, large numbers of Cincinnati manufacturers, especially in the machinery, electrical and similar lines, having found it difficult to get men able to handle the work.

Methods of Making Electrolysis Surveys.—A paper dealing with the methods of procedure to be followed in examining underground pipes and cables, and the return systems of electric railways, in order to determine the liability of the pipes and cables to damage from stray electric currents from the railways, has been published by the Bureau of Standards (Technologic Paper No. 28). The various classes of electrical measurements are described and methods of procedure are outlined in some detail. The selection of instruments for making such tests is treated, and some of the more important considerations involved in the interpretation of the results of electrolysis surveys are discussed. This paper is now ready for distribution and those interested in the subject may obtain a copy free by addressing a request to the bureau.

Associations and Societies

A complete Directory of Electrical Associations is regularly printed in the first issue of each month on the next-to-last text page.

Reduced Rates for Jovian Convention.—The Big Four Route of the New York Central Lines is offering reduced rates to delegates wishing to attend the annual convention of the Jovian Order at Indianapolis from Oct. 18 to 20.

New Mexico Electrical Association.—The executive meeting of the New Mexico Electrical Association will be held at El Paso, Tex., on Oct. 15, 16 and 17, with headquarters at the El Paso Del Norte Hotel. E. A. Thiele of Roswell, N. M., is secretary pro tem.

Cleveland Electrical League.—On Sept. 14 Dean H. P. Abbott of Trinity Cathedral addressed the first weekly meeting of the Cleveland Electrical League held in the new quarters at the Hotel Statler. His subject was "Courage." Former Senator Theodore E. Burton addressed the league last Thursday.

Iowa District Section N. E. L. A.—The joint committee of the Iowa section of the National Electric Light Association, the Iowa Electric Railway Association and the Iowa District Gas Association have decided to hold their 1917 conventions in Des Moines, it is reported. The gas men will meet on May 22 and 23 and the electric light and railway men on May 24 and 25.

Pittsfield (Mass.) Jovian League.—Members of the local league held their annual outing on Sept. 9 at Idlewild Hotel, South Williamstown. Dinner was served at the Inn and was followed by a business meeting, at which the following officers were chosen for the ensuing year. President, H. W. Derry; vice-president, Thomas G. Crawford; secretary-treasurer, J. O. Roser. The league voted to hold an electrical fair during "America's Electrical Week," Dec. 2 to 9, on much the same plan that was pursued last year. Details were left in the hands of a committee.

Philadelphia Meeting of A. I. E. E.—The 325th meeting of the American Institute of Electrical Engineers will be held on Oct. 13 in Philadelphia, Pa., at the University of Pennsylvania. The subject of the meeting will be "Electrical Supply for Large Single-Phase Load." Four papers, two by representatives of operating companies and two by representatives of manufacturing companies, will cover the subject. There will be sessions both in the afternoon and evening. The program for the afternoon session will comprise papers by W. C. Eglin and Philip Torchio, representing the operating companies. In the evening the papers representing the manufacturing companies will be presented, the titles and authors of which will be announced later.

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

RESEARCH SAVES LAMP TRADE

Potash Replaced by Soda in Formula for Making Incandescent Lamp Bulbs

The great scarcity of potash has almost crippled many of the industries in this country, notable among others being the glass industry. The glass used in making incandescent electric lamp bulbs is a very special kind that must withstand sudden changes of temperature and also great pressure. Heretofore it has been thought that only glass made with a certain amount of potash was suitable for the lamp industry.

The outbreak of the war two years ago cut off all supply of potash from Germany and threatened the supply of glass. The research chemists of the General Electric Company, however, succeeded in producing a glass for making incandescent electric lamp bulbs by replacing potash with soda in the glass mixture. This glass, it has been stated, has proved superior to the old potash glass; so much so, indeed, that from now on potash glass will no longer be used.

The world supply of potash comes almost entirely from Stassfurt in Germany, because the natural deposits there have been cheaper to work than any other known source. These sources of supply in the United States have proved utterly inadequate to meet the great demand of the industries. Soda, on the other hand, is produced from ordinary table salt, great natural deposits of which are to be found in different parts of the country.

ORNAMENTAL LIGHTING STANDARD BUSINESS

Demand Is Mostly for the Installation of New Systems for Which Single Lamp Standards as a Rule Are Specified

Ordinarily there are two seasons that show greater activity in the demand for ornamental lighting standards than the rest of the year, namely fall and spring. Winter months are poor owing to frost conditions and in the summer the municipalities generally put off buying until the last minute. This year, however, the demand has been excellent all of the time culminating in a very brisk fall buying. Inasmuch as the largest buying class of this type of material are the municipalities it is difficult to assign any reason for this year's condition of trade.

Most of the business this year has been for new installations, though a fair volume of trade has come from extensions to existing systems. Few orders have been placed for cluster lamp standards, the single lamp standard being specified in most cases. Of those orders for cluster lamp standards, it is understood that the majority have been for additions to systems now using such standards.

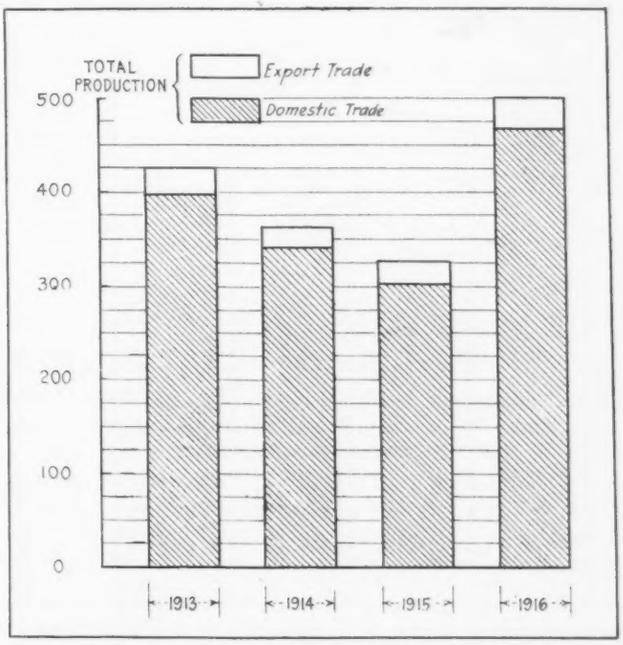
In spite of the great increase in cost of labor and manufacturing materials there has generally been but a small advance in the price of standards. This is probably owing principally to the competition in the field.

Deliveries are good for this year, they being but little longer than ordinarily. Manufacturing materials have held up deliveries somewhat as has also foundry congestion. Casting of lighting standards is but one of many lines undertaken by the foundries. The congestion that has occurred has not been in the production of standards, but of other materials for which the demand has been enormous. In almost every instance that standards have been late in being delivered, however, it has been found that the installation of the system was being held up not by the delay in the delivery of standards, but by late deliveries of cable and conduit.

RELATION OF FOREIGN TRADE TO TOTAL PRODUCTION

Approximately Seven Per Cent of the Electrical Products Which Are Manufactured in the United States Are Exported

The electrical export trade of the United States is considerably smaller than is generally supposed. Previous to the current year the largest export trade of electrical goods was in 1913, which year was also the largest electrical manufacturing year in the United States previous to 1916. For the year 1913 the electrical exports amounted in round numbers to $28,200,000 while the total production of electrical goods in the United States had a value in the neighborhood of $425,000,000. The ratio of exports to total production was 6.65 per cent.



TOTAL PRODUCTION OF ELECTRICAL GOODS IN HUNDRED OF MILLIONS OF DOLLARS, SHOWING PORTION EXPORTED

In the following year, which saw the outbreak of the European war, both production and exports fell off, the former to $360,000,000 and the latter to $20,000,000. In this year the ratio of exports to production was 5.55 per cent. Last year production fell to its lowest in some years, amounting to between $300,000,000 and $350,000,000. Electrical exports, however, increased in value to $24,300,000, showing a ratio of 7 to 8 per cent.

Estimates made by the ELECTRICAL WORLD for the current year based on figures obtained for previous months place the value of electrical exports at the record figure of $35,000,000 and production at considerably over $500,000,000. The 1916 ratio of exports to production would, therefore, be less than 7 per cent.

The most recent year for which there are available detailed figures for both production and exports is 1914. While

this year is hardly a fair one to show relations owing to abnormal conditions during the last five months brought about by the war, the relations between exports and production are sufficiently interesting to record. These figures are shown in the accompanying table.

It will be noticed that in 1914 the largest relative export trade was in generators, amounting to over 10 per cent of the total value of generators produced in the United States in 1914. In 1915 the exports of generators was less than in 1914 by 21 per cent. In the first six months of the current year the exports of generators fell off still more, being less than 40 per cent during the first half of 1915. Since 1916 production is very large the export ratio for 1916 will be much smaller than that for 1914.

In the largest line of electrical manufacture, namely insulated wire and cable, the 1914 ratio of exports to production was the lowest of all products. Out of a total production of $69,505,573 but $1,321,451 or 1.91 per cent was exported. The next largest line of manufacture is that of motors and of a production of $44,176,235, there was exported $3,300,839 or 7.48 per cent. This figure is somewhat above the average.

There is one export ratio which will undoubtedly be much larger for 1916, and that is for tungsten lamps. With Germany out of the foreign market and with England practically unable to supply the domestic demand the export of tungsten lamps of American manufacture has grown rapidly.

RELATION OF 1914 ELECTRICAL EXPORTS TO TOTAL PRODUCTION

Articles	Total Production	Exports	Ratio of Exports to Production in Per Cent
Batteries	$23,402,455	$635,522	2.82
Generators	23,233,437	2,372,816	10.22
Insulated wire and cable	69,505,573	1,321,451	1.91
Interior wiring supplies including fixtures	8,896,564	591,136	6.65
Arc lamps	742,142	42,782	5.78
Carbon lamps	1,397,572	88,025	6.31
Tungsten lamps	11,886,354	278,061	2.34
Measuring instruments	8,786,506	*157,386	1.79
Motors	44,176,235	3,300,839	7.48
Telegraph instruments, including wireless	2,248,375	93,563	4.16
Telephones	22,815,640	1,251,788	5.49
Transformers	13,120,065	934,312	7.13
Miscellaneous	129,201,758	8,895,434	6.89
	$359,412,676	$19,963,115	5.55

*Covers period beginning July 1.

THE WIRE MANUFACTURING INDUSTRIES IN GREAT BRITAIN

War Trade Restrictions Prevent Orders Being Filled for Other Than War Requirements—Opportunities for American Wire Manufacturers

The position in the British wire manufacturing industries, which have of late had to contend with increasing difficulties as a result of the further somewhat stringent restrictions of the war trade officials in London, has not materially improved during the past few weeks. The overseas trade of Great Britain in the wire-drawing industries, as a further outcome of those restrictions, which are considered as somewhat arbitrary by British manufacturers, has practically dwindled into a negligible quantity.

While the ordinary trade inquiries for copper wire, strip, etc., for electrical purposes have been fairly satisfactory, the inability to fulfil orders other than for direct war requirements has resulted in largely increased inquiries being sent to the United States, but there still remains over a substantial margin of normal trade inquiries awaiting the first favorable opportunity for attention.

There are undoubtedly excellent opportunities awaiting American wire manufacturers to capture a further considerable trade in copper wire, strip, etc., in England, which British wire manufacturers, as a result of the heavy Government demands made upon them, and the constantly increasing difficulties, in the shape of labor shortage, transit restrictions, etc. are themselves unable to satisfy. A large amount of American copper wire has been bought and retailed by many of the most important wire manufacturers in Great Britain.

HALF-A-BILLION YEAR

Estimates Based on Business During First Eight Months of 1916, Which Shows 70 Per Cent Increase Over Similar 1915 Period

This will be a $500,000,000 year or better for electrical manufacturers according to estimates based on the business of the first eight months of the current year. Previous to 1916 the most prosperous year in electrical manufacturing was 1913 when the business done was in the neighborhood of $425,000,000. During the first eight months of 1916 the volume of electrical manufacturing business was around 70 per cent greater than during the corresponding period of 1915.

RELATION OF WESTERN ELECTRIC TO BELL SYSTEM

Manufacturer, Official Purchasing Agent, Storekeeper and Distributing Agent for the Greatest Telephone System in This Country

As is well known, a very close relationship exists between the Western Electric Company and the Bell Telephone System. As a jobber and the third largest manufacturer of electrical goods in the United States, with branch offices all over the country, this company is probably best known to the electrical trade generally. On the other hand, the bulk of its business is the telephone supply business, most of which is with the various constituent companies of the Bell system.

In 1881 the Western Electric Company was incorporated and a contract was made the next year between the American Bell Telephone Company and the Western Electric by which the latter should make all of the telephones for the telephone company, and become licensed under the telephone company's patents to make apparatus for the telephone company's licenses. From that time on the company grew until it is now the manufacturer for the Bell system.

From the beginning the Western Electric did, in addition to its manufacturing business, a jobbing business and gradually developed to the point where it was furnishing the Bell companies a large proportion of their requirements of line material and material not of Western Electric manufacture. This led to the inauguration about fifteen years ago of the "supply contract." By this means the Western Electric gradually became purchasing agent for the Bell system.

In discussing this relation of the company with the Bell system in the company's house organ, the *Western Electric News*, President H. B. Thayer says:

"As manufacturer we provide what is wanted of uniform quality and at reasonable cost. For the Bell companies we are officially purchasing agent and storekeeper. In this relation we maintain a large organization to find sources of supply, to study the quality and price conditions and transportation costs, besides actually buying and delivering the material.

"We gather their materials from the various factories, including our own, and distribute them through thirty-four warehouses, which we maintain in the more important cities and distributing centers of the country. We also distribute such material direct from the factory to the place where it is to be utilized, as, for instance, line material which is shipped often from various factories to points along a line under construction. We fill annually for the companies under this contract about 500,000 orders. Some orders call for a single, small item. Some call for big switchboards. There is no way of estimating the value of the efficiency and economy coming out of this relation, because since it first went into effect many other improvements have been working toward greater efficiency and economy.

"There are about 10,500 telephone companies in the United States; and 5620 of them were our customers during 1915 for some portion of their requirements. Thus it is that the Western Electric Company has become a supplier to connecting and potentially connecting companies. The Western Electric Company is the workshop of the Bell system."

Manufacturing and Industrial

Max W. Zabel announces the removal of his office from 1332 Monadnock Block to room 1336 in the same building. He will continue to conduct the practice of patent and trademark law.

A. H. Sullivan, manager of the Columbia Electric & Engineering Company of Lincoln, Neb., has become connected with the electrical engineering department of the Bion J. Arnold Company of Chicago.

The Wagner Electric Manufacturing Company of St. Louis announces the opening of a sales office and service station at 922 North Pennsylvania Street, Indianapolis, Ind. The office will be in charge of Mr. Charles M. Welch.

The Greenwood Advertising Company (Western), 1942-1946 South Main Street, Los Angeles, Cal., announces that it has taken over the Brown Flasher & Manufacturing Company and is ready to supply the trade with any type of flasher made.

The Trumbull Electric Manufacturing Company, Plainville, Conn., has moved its Chicago office from 15 South Desplaines Street to larger and more convenient quarters at 40 South Clinton Street. W. P. Naser, branch manager, is in charge of this office.

A. B. Hatch, who for the past ten years has been secretary of the Pelouz Manufacturing Company, Chicago, and who for six years was manager and secretary of the company, has resigned to accept the position as manager of the C. A. Taylor Trunk Works, Chicago.

The Lincoln Electric Company, Cleveland, Ohio, has appointed the Read-Dresser Engineering Company, 149 Broadway, New York, its agent in charge of territory embracing part of Connecticut, New York City and neighboring counties in New York State and the northern counties in New Jersey.

The Fornes-Walters Electric Company, 201 Third Street, N. W., Canton, Ohio, has recently been formed and is engaged in the electrical contracting and supply business. G. F. Fornes is president, W. H. Burgener, vice-president; S. L. Fornes, secretary and treasurer, and R. H. Walters, general manager.

Orders for Overhead Protective Crossing Clamps.—Edwin G. Hatch, New York, has recently received orders from the Schuylkill Gas & Electric Company, the Lehigh Navigation Electric Company, the East Haddam Electric Light Company and since the beginning of the year three orders from the Illinois Traction System for protective clamps.

Howell Electric Motors Company, Howell, Mich., announces that it has recently increased its capital stock from $30,000 to $100,000. The company manufactures standard squirrel cage and slip-ring polyhase electric motors from 0.5 hp. to 100 hp. The officers are H. N, Spencer, president; C. L. Daun, vice-president and manager; W. M. Spencer, secretary and treasurer, and C. F. Norton, sales manager.

The Edison Storage Battery Supply Company, Orange, N. J., announces the opening of its Los Angeles office on the fourth floor of the San Fernando Building, corner Fourth and Main Streets. James F. Rogan, who has been acting as local distributor of Edison storage batteries in Los Angeles, will become resident manager. The Edison Storage Battery Supply Company also maintains two other offices on the Pacific Coast, one at 206 First Street, San Francisco, in charge of District Manager E. M. Cutting, and another at 65 Columbia Street, Seattle, under F. C. Gibson as resident manager.

The Main Electric Manufacturing Company, 500 Aiken Avenue, Pittsburgh, Pa., maker of small generating plants. announces that it has been enjoying exceptionally good business the past few months, a period of the year usually somewhat dull for the company. Orders have been coming in large numbers from various parts of this country and from such foreign countries as the West Indies, Brazil, Costa Rica, and Canada. M. E. Main, president of the company, states that the new battery-charging outfit which his concern has recently brought out has been especially successful and orders are steadily being received for it.

Combustion Engineering Corporation Holds Sales Convention.—A meeting of the sales managers and executives of the Combustion Engineering Corporation, 11 Broadway, New York City, manufacturer of stokers, was held on Sept. 15 and 16. This meeting was called by G. E. Learnard, vice-president of the company, in order to enable all of the men who are directing the sales efforts of the company to meet and become more thoroughly acquainted, to interchange ideas and to ask questions, and to become more familiar with improvements in the company's products.

The Electric Equipment Company of Los Angeles, Cal., has added extensively to the line of products for which it acts as a direct factory service station. The line now includes "U. S. L." storage batteries, "Eisemann" magnetos, "Mea" magnetos, "Disco" electric starters, "North East" electric starters, "Bijur" electric starters, "Detroit" electric starters, "Ward Leonard" electric starters, "Eeco" magnet chargers and magnetmeters, "Klaxon" horns, "Atwater-Kent" ignition and "Dyneto" electric starting and lighting system. Ground is being broken for a new store building on Bush Street, near Van Ness Street, in San Francisco, which will be completed in about ninety days.

NEW YORK METAL MARKET PRICES

	Sept. 12 — Selling Prices Bid	Asked	Sept. 19 — Selling Prices Bid	Asked
Copper	£ s d		£ s d	
London, standard spot	111 0 0		116 0 0	
Prime Lake	27.62½	to 28.00†	27.75	to 28.25†
Electrolytic	28.12½	to 28.37½†	28.37½	to 28.62½†
Casting	25.50	to 25.75†	26.00	to 26.25†
Copper wire	33.00†		33.00†	
Lead	6.50		7.00	
Nickel	45.00	to 50.00	....	to 50.00
Sheet zinc, f.o.b. smelter	15.00†		15.00†	
Spelter	9.17½	to 9.30	9.55	to 9.80
Tin, straits	38.30		38.50	
Aluminum, 98 to 99 per cent	59.00	to 61.00†	60.00	to 62.00†

OLD METALS

Heavy copper and wire	22.00 to 22.50†	22.00 to 22.50†
Brass, heavy	12.75 to 13.00†	12.75 to 13.00†
Brass, light	9.10 to 10.50†	9.10 to 10.50†
Lead, heavy	5.50 to 5.62½†	5.65 to 5.87½†
Zinc, scrap	6.00 to 6.50†	6.00 to 6.50†

COPPER EXPORTS

Total tons to Sept. 19 16,310

†Nominal.

Corporate and Financial

Edison Electric Illuminating Company of Boston, Mass.—A gain of nearly 12 per cent in gross earnings is recorded in the return of the company filed with the Massachusetts Gas & Electric Light Commission for the year ended June 30, 1916, the respective gross revenues for the year and for the fiscal year 1915 being $8,302,814 and $7,429,124. Operating expenses were $4,619,184 for 1916, or only $287,839 more than in 1915. The number of customers increased from 72,902 to 86,018 and the total energy delivered at the station buses was 233,258,883 kw.-hr., compared with 198,390,200 the year previous. The comparative sources of revenue for the two years are given below:

Revenue from	1916.	1915.
Commercial lighting	$5,653,226	$4,947,922
Power service	1,482,707	1,339,321
Energy sold to street railways	197,361	184,843
Street arc lighting	488,808	561,085
Street incandescent lighting	377,463	306,106
Energy to other companies and to municipalities	103,248	89,845

During the year just closed the company declared 12 per cent in dividends, the total being $2,707,764. The outstanding capital stock at the end of the year was $22,518,200, on which premiums had been paid to the extent of $17,906 896. There were $1,405,000 in bonds outstanding, and the total liabilities of the company on June 30 last were $48,689,680, the total surplus being $155,012. The operating ratio for the year was 55.6 per cent.

The output of the Edison system, which now covers about 750 square miles of territory, during the last fiscal year was as follows: Total energy sold, 157,839,680 kw.-hr., compared with 137,140,617 kw.-hr. sold during the year; energy used by company, 9,384,277 kw.-hr., compared with 8,447,725 kw.-hr. in 1915; total energy unaccounted for, 56,034,926 kw.-hr., against 51 801,858 kw.-hr. last year;

total energy accounted for in 1916, 167,223,957 kw.-hr., and in 1915, 146,588,342 kw.-hr. The maximum load occurred on Dec. 13, 1915, and totaled 72,802 kw., that of last year being 65,342 kw. In 1916 the company consumed 198,951 tons of coal, compared with 182,679 tons the previous year, and the average cost of coal per ton used and accounted for was $3.78 in 1916 and $3.90 in 1915. The connected load on June 30, 1916 was 243,337 kw., composed of the following classes of service: Commercial incandescents, 122,683 kw.; municipal incandescents, 1357 kw.; commercial arcs, 1108 kw.; municipal arcs, 2801 kw.; street railways, 37,400 kw.; power customers' motors, 77,988 kw. During the year the connected motor load exclusive of street railways increased 5906 kw.; the street railway connected load increased 5150 kw., and the commercial incandescent connected load increased 13,048 kw. An exceedingly vigorous house-wiring campaign has been in progress throughout the year. Of the customers on June 30 last, 10,183 used both lighting and power service; 1237 used power only, and 74,262 used lighting service only. In the generating department the company lists eighty-three boilers with a combined rating of 40,136 hp., and twenty-seven steam-generating units, with a combined rating of 160,600 hp. The latter include seventeen reciprocating engines rated at from 650 to 2500 hp., and ten turbo-generators rated at from 700 hp. to 20,000 hp., the company having three turbines of the last-named size. In the main the system output is carried by the large turbines of the L Street station in South Boston, supplemented by the Atlantic Avenue direct-current generating station. The total capacity of the generators on the system is 116,400 kw., and there are sixteen storage batteries and numerous substations.

The principal operating expenses for the 1916 year were: Manufacturing expense, $1,420,122; distribution, $932,996; office expenses and management, $904,732; taxes, $954,760; miscellaneous, $406,497. The manufacturing expense was composed of the following items: Fuel, $751,666; rentals, real estate, $42,934; oil, waste and packing, $3,558; water, $21,173; station wages, $344 852; station tools, appliances, etc., $2,456; station structural repairs, $14,572; steam plant repairs, $114,375; electric plant repairs, $124,532. The subdivision of distribution expenses was: Care of lights and meters, meter reading, collections, $73 630; maintenance and renewals of street lamps, $152,744; renewals of commercial lamps, $187,558; repairs and renewals of lines and conduits, $438,611; repairs and renewals of meters and transformers, $80,451.

King's County Lighting Company, Brooklyn, N. Y.—The company has been given permission by the Public Service Commission of the First District of New York to issue additional bonds to the amount of $675,000 on the condition that $134,545.43 of the proceeds of the bond issue shall be credited to the company's depreciation fund, $472,-954.57 for improvements and $67,500 for expenses of sale and discount. Another order issued by the commission calls for a rehearing on the company's affairs. At this hearing it is to be determined whether the company shall reclassify its fixed capital account in accordance with the classification prescribed by the commission, as well as whether the company shall increase its reserve for accrued amortization of capital by transferring from its surplus such amounts as the commission believes to be necessary.

Public Service Corporation of New Jersey, Newark, N. J.—Directors of the corporation at a meeting on Sept. 19 issued to stockholders $5,000,000 of the $25,000,000 stock authorized at the stockholders' meeting last summer. The new stock will raise the company's outstanding capitalization to $30,000,000. Stockholders may subscribe to the new stock at par until Oct. 2, and may pay for it on or before Nov. 1, in which event they will receive 5 per cent interest to Jan. 1, or they may pay at any time before Jan. 1, when the new stock will become entitled to dividends. In recent years improvements and extensions have been financed by the sale of notes or bonds. The directors decided to transact such financing in the future by stock. By so doing they conferred rights of value to stockholders, the last sale of stock having been at 134. The directors also declared a quarterly dividend of 2 per cent, which is the second dividend at the 8 per cent annual rate. The dividend is payable on Sept. 30 to stock of record Sept. 25.

New Utility and Industrial Companies

The Electric Equipment Company of Des Moines, Iowa, has been incorporated by A. H. Rich, E. G. Klimpke, G. W. Peters and H. B. Huftly. The company is capitalized at $10,000.

The Essex Tool Works of Newark, N. J., has filed articles of incorporation with a capital stock of $25,000 to do a general electrical and mechanical engineering business. The incorporators are: J. W. Rosenbaum, J. H. Cohen and E. Sherman of Newark, N. J.

The Artificial Daylighting Company of New York N. Y., has been incorporated with a capital stock of $50,000 by I. Mulcay, I. B. Lewis and C. Swanson, 203 Broadway, New York City. The company proposes to deal in fixtures, lighting and illuminating equipment.

The Crescent Electric Company of Sheridan, Wyo., has been incorporated by John S. Backus, E. C. Conley and B. L. Conley of Sheridan, Wyo. The company is capitalized at $10,000 and proposes to do a general electrical business and deal in electrical devices and supplies of all kinds.

S. V. M. Sales Corporation of New York, N. Y., has filed articles of incorporation with a capital stock of $600,000. The company proposes to manufacture and deal in motors, engines, machinery and electrical devices. The incorporators are: F. Ducasse, E. L. Russell, 1765 Broadway; E. F. Gates, 30 East Forty-second Street, New York, N. Y.

Trade Publications

Rectifiers.—The Imperial Electrical Company, Union City, Ind., has issued a four-page leaflet descriptive of its new "Imperial" rectifier for charging batteries.

Lighting Fixtures.—The Consolidated Lamp & Glass Company, Coraopolis, Pa., has prepared a four-page folder which contains information on its "Cora" semi-indirect Bowls.

Electrical Household Appliances.—The Pelouze Manufacturing Company, 232-242 East Ohio Street, Chicago, Ill., has prepared a small illustrated bulletin on its electrical household appliances.

Galvanometer.—The Type R inexpensive galvanometer of high sensitivity is described and illustrated in a leaflet issued by the Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa.

Railway Line Material.—The General Electric Company of Schenectady, N. Y., has issued bulletin No. 4404-A (superseding bulletin No. 44004) on "Railway Line Material for Direct Suspension." The bulletin is well illustrated.

Electrical Insulation.—A neat booklet containing valuable data on "Dependable Insulation" has been issued by the Dielectric Manufacturing Company of St. Louis. There are numerous interesting insulation curves in this booklet.

Ground Cone.—Hickey & Schneider, 61 Broadway, New York City, have issued an illustrated leaflet on Burn-Boston carbon ground cones; Johnson transmission tap clamps, H. & S. cross-over protecting clamps, and H. & S. seamless copper splicing sleeves.

Hydraulic Turbines.—The S. Morgan Smith Company, York, Pa., has issued bulletin No. 104 which is attractively illustrated and which contains considerable information on various types of hydraulic turbines. The bulletin is made up of sixty-seven pages and besides the actual descriptions of apparatus contains useful tables.

Instruments and Relays.—The Westinghouse Electric & Manufacturing Company, of Pittsburgh, Pa., has recently issued catalog 3-B, which contains illustrations and descriptions of Westinghouse switchboard, portable and precision instruments, ammeter shunts, instrument transformers and relays. The text is well gotten up and contains 120 pages.

Insulators.—"The Insulator Book" is the title of a handsomely bound and illustrated book recently prepared by the Locke Insulator Manufacturing Company of Victor, N. Y. Besides giving complete data on the Victor line of insulators and supplies, many useful wire tables are given, including specifications for bare hard-drawn copper wire, untreated cross-arms, transmission towers and poles.

New England

BROCKTON, MASS.—The Edison Electric Illuminating Company of Brockton has petitioned the State Gas and Electric Light Commissioners for permission to issue 4920 additional shares of capital stock at $140, the proceeds to be used for improvements contemplated or under way, including the construction of a large power plant in East Bridgewater, the stringing of a heavier feed wire in Brockton and through the city to Montello, the inauguration of a new service through West Bridgewater to a point in Brockton near the fair grounds and the construction of a new underground conduit on Pleasant Street; the erection of a new service line from Montello to Abington, the laying out of an alternative service to that town, the building of a new terminal house in Brockton, increasing the company's facilities for supplying energy in Stoughton and the extension of its service in Hanover and Hanson so that it may, if need be, furnish energy for the Silver Lake and Sandy Pond pumping station.

EAST BRAINTREE, MASS.—Preparations are being made for the installation of a new turbine engine at the municipal electric plant. The system will be changed from two to three phase.

SALEM, MASS.—The Salem Electric Lighting Company is reported to be contemplating the installation of another turbine engine, increasing the output of its plant to 23,000 hp.

TAUNTON, MASS.—The extension of the transmission lines of the municipal electric-light system into the town of Raynham is under consideration.

EAST NORWALK, CONN.—At a special election held Sept. 11 the proposal to lease the municipal electric plant to the United Electric Light & Water Company for a period of 20 years and enter into a contract with the company for street lighting was defeated.

GREENWICH, CONN.—Plans are being considered by the New York, New Haven & Hartford Railroad Company for the construction of a large switch plant, calling for a tower to house 32 electric machines and 16 mechanical machines. Of these 21 electrical and 10 mechanical will be installed with the tower. This work will be done by the company's own forces.

NEW BRITAIN, CONN.—The contract for electric wiring for the new Burritt School has been awarded to the Spring & Buckley Electric Company of New Britain, at $3,924.

Middle Atlantic

ALBANY, N. Y.—Bids will be received by General W. W. Witherspoon, superintendent of public works, Capitol, Albany, N. Y., until Oct. 10, for furnishing and installing new governor equipment for the hydro-electric power plant on the Erie Canal near the east end of the Crescent dam. Plans, sheets 1 to 3, will be furnished by the State Engineer at 10 cents per sheet. The cost is estimated at $6 310.

ARCADE, N. Y.—A special election will soon be called to vote on the proposal to appropriate $2,506 for the installation of a smoke consumer at the municipal electric-light plant.

BROOKLYN, N. Y.—Bids will be received by C. B. J. Snyder, superintendent of buildings, Department of Education, Fifty-ninth Street, and Park Avenue, New York, N. Y., until Oct. 2, for alterations, fire protection, sanitary, heating, electric work, etc., duplicate school plan, at Public School 132, Manhattan Avenue and Conselyea Street, and Public School 165, Lott Avenue, between Hopkinson Avenue and Amboy Street, Brooklyn. Plans and specifications may be seen at the above office and also at branch office, 131 Livingston Street, Brooklyn, N. Y.

BROOKLYN, N. Y.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Oct. 3, for furnishing and installing indicators, and delivering cartridge cases, powder tanks, electric water heaters, motors, fuel oil meters, electric bake ovens, machine tools, steel pipe, bronze chain, sheet brass, bronze, lead and steel, steel shapes, boiler plates, composition pipe fittings, unions, valves, telephone cable and single conductor wire, etc., at the navy yard, Brooklyn, N. Y. Proposal blanks may be obtained upon application to the above bureau or to the supply officer, navy yard, Brooklyn, N. Y.

BROOKLYN, N. Y.—Bids will be received by C. B. J. Snyder, superintendent of school buildings, Department of Education, Fifty-ninth and Park Avenue, New York, N. Y., until Sept. 27 for installing electric-light equipment in Public Schools 1, 12, 32, 75, 90 and 116, borough of Brooklyn. Bids will also be received at the same time and place for alterations, fire protection, sanitary, heating, electric work, etc., for duplicate school plan, at Public Schools 126, 149, 150, 156 and 173, borough of Brooklyn. A separate proposal must be submitted for each item. Blank forms, plans and specifications may be obtained at the above office and also at branch office, 131 Livingston Street, Brooklyn, N. Y.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

DANSVILLE, N. Y.—An extension is being erected to the plant of the Dansville Gas & Electric Company to provide space for a 250-hp. water tube boiler. Contracts for the work have been placed.

ELMIRA, N. Y.—The Public Service Commission has approved franchises granted to the Elmira Water, Light & Railroad Company for electric plants and distributing systems in Montour, Catherine and Odessa.

HUDSON, N. Y.—Bids will be received by Mrs. Annie Windsor Allen, president of the board of managers of the New York State Training School for Girls, Hudson, N. Y., until Sept. 26 for heating work and stokers for boilers at the New York State Training School for Girls. For details see proposal columns.

ITHACA, N. Y.—The Ithaca Gas & Electric Company has applied to the Public Service Commission for approval of the purchase of the capital stock of the Homer & Cortland Gas & Light Company.

NEW YORK, N. Y.—Bids will be received by C. B. J. Snyder, superintendent of school buildings, Department of Education, Fifty-ninth Street and Park Avenue, New York, N. Y., until Sept. 25 for additions and alterations to the electric equipment, duplicate school plan, at Public Schools 72, 101, 168 and 171, borough of Manhattan.

NEW YORK, N. Y.—Plans are being prepared by the engineering department of the Pennsylvania Railroad for the installation of an electric switch and signal system for the New York Connecting Railroad Company. The signal work, it is understood, will be installed by the Pennsylvania Railroad Company and the New York, New Haven & Hartford Company jointly.

SONYEA, N. Y.—Bids will be received by Percy L. Lang, president board of managers of Craig Colony for Epliptics at Sonyea, N. Y., until Oct. 10, for construction, plumbing, electric work, etc., for alterations and additions to storehouse and cold storage plant and additions and alterations to water supply, heating and electric work at Craig Colony for Euileptics, Sonyea. Drawings and specifications may be obtained at the Department of Architecture, Capitol, Albany. Lewis F. Pilcher is State architect.

SYRACUSE, N. Y.—A permit has been granted by the Bureau of Building to the Hoatling-Warner Company for the erection of a power plant in the rear of the company's plant at 720 North Clinton Street.

TOMPKINSVILLE, N. Y.—Bids will be received at the office of the inspector, third light house district, Tompkinsville, N. Y., until Sept. 25 for furnishing stove parts and electric lamps.

FRANKLIN, PA.—The Franklin Electric & Ice Company has been granted a 25-yr. franchise to operate an electric-light and power service in Franklin. Control of the company is reported to have recently changed hands. Extensive improvements are reported under way in the generating and distributing systems.

PHILADELPHIA, PA.—Contract for construction of a power plant for S. B. & B. W. Fleisher, manufacturers of yarns and worsteds, to cost $70,000, has been awarded to W. Steel & Sons Company of Philadelphia.

POTTSTOWN, PA.—The Philadelphia Suburban Gas & Electric Company of Pottstown has acquired a site of five acres in Cromby, near Phoenixville, on which it proposes to erect a large power station to supply electricity in Phoenixville, Pottstown and West Chester. The building will be 150 ft. by 50 ft. Two 5000-kw. generators will be installed, driven by steam power. Plans call for the completion of the plant by January, 1918.

READING, PA.—The Reading Transit & Light Company is contemplating the construction of a new high-tension transmission line to Kutztown for service to the Allentown-Reading electric railway.

ROCHESTER, PA.—Bids will be received at the office of the Secretary of the Council, Rochester, Pa., until Oct. 2, for lighting the streets and highways of the borough of Rochester for a period of five years with electricity, using series tungsten lamps of 80, 100, 250 and 400 cp. James W. Doncaster is secretary.

SHARON, PA.—The Mahoning & Shenango Railway & Light Company of Youngstown has awarded contract for the erection of a high-tension transmission line from the generating station at Lowellville to Sharon, a distance of 14 miles, to the Stone & Webster Engineering Corporation of Boston, Mass. The wires will be carried on steel towers.

STEELTON, PA.—Steps have been taken toward installing a new lighting system on Front and Second Streets. It is proposed to use lamps erected on standards.

NEWARK, N. J.—Plans have been filed by the Public Service Electric Company for a one-story screen house at its new power plant at Point-No-Point.

NEWARK, N. J.—Plans have been prepared by the Electric Laundry Company for the construction of a new plant. Arthur L. Richards is president of the company.

PATERSON, N. J.—The city of Paterson is contemplating the installation of a new fire and police telegraph alarm system. H. J. Harder is city engineer.

TRENTON, N. J.—Bids will be received by the City Commission until Sept. 27 for the erection of a new electrical building for city service. William P. Endebrook, American Mechanic Building, Trenton, architect.

BALTIMORE, MD.—A committee has been appointed by the Board of Education to make investigations relative to the installation of an electric light plant at the Normal School.

BALTIMORE, MD.—The Consolidated Gas, Electric Light & Power Company of Baltimore, it is announced, will offer $3,697,912 additional capital stock, the proceeds to be used for the acquisition of property, improvements, completion of extension of distribution system, etc.

MORGANTOWN, W. VA.—Bids will be received by the State Board of Control, Charleston, W. Va., about Nov. 1 for the erection of a dormitory, 220 ft. by 43 ft., and Agriculture Building, 188 ft. by 64 ft., at the West Virginia University; electric and gas lighting and steam heat, to cost about $300,000. Paul A. Davis, third, 1713 Sansom Street, Philadelphia, Pa., is architect. James S. Lakin of Charleston, is president of state board of control.

NORFOLK, VA.—B. F. Mitchell, Seaboard Bank Building, Norfolk, architect, has been engaged to prepare plans for a retail market, 150 ft. by 270 ft., to be erected by the city. The building, including electric refrigerating machinery, electric elevator and incinerator will cost about $100,000.

RICHMOND VA.—The Administrative Board has instructed E. W. Trafford, superintendent of the municipal electric-light plant, to prepare specifications for an electrically driven pump to be added to present units at the municipal waterworks pumping station, to cost about $5,000.

RICHMOND, VA.—The Richmond Lumber Company has awarded contract for erection of building, 75 ft. by 220 ft., to cost $7,500 and for fireproof power plant, to H. L. Barker, Richmond, Va. Most of the machinery has been purchased. Hackley Morrison of Richmond, is construction engineer.

WARRENTON, VA.—The Warrenton Electric Light & Ice Company is contemplating the installation of a 45 or 60-kw., 2300-volt generator, complete with exciter and switchboard and the erection of about 8 miles of pole line. The company would like to receive prices, etc., on material and equipment for the above work. M. J. O'Connell is general manager.

WASHINGTON, D. C.—Bids will be received at the office of the purchasing agent, commissioners of the District of Columbia, Washington, D. C., until Oct. 2 for furnishing two electric incubators, seasoned oak chamber, for the Central High School.

WASHINGTON, D. C.—Bids will be received by the Secretary of the Department of the Interior, Washington, D. C., until Oct. 4 for installing two electrically operated elevators in the St. Elizabeth Hospital, Washington, D. C., one each in kitchen and in laundry.

WASHINGTON, D. C.—Bids will be received by the Secretary of the Department of Agriculture, Washington, D. C., until Sept. 29 for furnishing and erecting one 10-ton electric carrying crane in building at Arlington Farm, near Rosslyn, Va. Further information may be obtained upon application to board of awards, Department of Agriculture.

WASHINGTON, D. C.—Bids will be received at the office of the supervising architect, Treasury Department, Washington,

D. C., until Oct. 18 for installation of one electric passenger elevator in the United States custom house, appraiser's stores and court house, Wilmington, N. C., and three electric elevators in the United States post office at New Haven, Conn. For details see proposal column.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Washington, D. C., for furnishing at the various navy yards and naval stations the following supplies: Newport, R. I., Schedule 135—one automobile ambulance; Schedule 136—25,000 lb. ingot copper, No. 1. Norfolk, Va., Schedule 143—four water tube boilers. Brooklyn, N. Y., Schedule 150—6000 ft. telephone cable, miscellaneous single-conductor wire. Brooklyn, N. Y., Mare Island, Cal., Schedule 138—eight turret-turning motors; Schedule 137—two electric bake ovens; Schedule 139—two emery grinders, two woodworker's lathes, two motor-driven drill presses, two 30-in. motor-driven band saws, two motor-driven saw tables; Schedule 142—two electrically operated ice-cream freezers, two electrically operated food and meat grinders, two electrically operated dishwashing machines, two electrically operated kitchen and cake machines and two electrically operated potato peelers. Washington, D. C., Schedule 158—14 steel tanks. Various, Schedule 160—16 portable electric drills. Applications for proposal blanks should designate the schedule desired by number.

North Central

SAGINAW, MICH. — The Consumers' Power Company has petitioned the City Council for an extension of 60 days of the time limit for installing the ornamental lighting system on Genesee Avenue and Court Street.

AMANDA, OHIO—The Scioto Valley Traction Company of Columbus has applied for a 25-year franchise to supply electricity in Amanda. The company also proposes to furnish electricity to farmers residing along the line.

CANAL WINCHESTER, OHIO. — The Scioto Valley Traction Company of Columbus has been granted a franchise to supply electricity in Canal Winchester. The company also has a franchise in Lithopolis and is reported to have purchased the Kingston franchise from Allen D. Newmyer of Ashville.

CINCINNATI, OHIO.—The contract for construction of the new building for the Young Men's Christian Association has been awarded to the Ohio Building & Construction Company, to cost about $330,000. The plans provide for a power house and electrical equipment throughout.

CINCINNATI, OHIO. — Contracts will soon be awarded by the Union Gas & Electric Company for equipment for a second section of its new plant in Cincinnati, now under construction. The company has already contracted for machinery and equipment to develop 125,000 kw. The power plant will be 220 ft. by 300 ft., 196 ft. in height, and will cost, when completed, $4,750,000.

CIRCLEVILLE, OHIO—The Circleville Light & Power Company is contemplating extending its services to Williamsport and Clarksburg. The company asks for a 25-year franchise and a ten-year contract in both towns.

CLEVELAND, OHIO—The City Council has voted to submit the proposal to issue $1,750,000 in bonds to enlarge the municipal electric-light plant to the voters at the November election.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, City Hall, Cleveland, Ohio, until Sept. 29 for furnishing electrolytic lightning arresters and electric equipment for the Department of Public Utilities. Specifications may be obtained on application to the office of the division of light and heat, room 204, City Hall.

CLEVELAND, OHIO.—The City Council has decided to submit to the voters at the November election the proposal to issue $1,750,000 in bonds for enlargement of the municipal electric-light plant and extension of distribution system. Negotiations, it is stated, are under way for the purchase of a 2000-kw. generator (second hand) for $20,000, which will enable the plant to supply energy to 5000 applicants who are urging the city for service. W. E. Davis, city light commissioner, has submitted a proposal to Fielder Sanders, street railway commissioner, for furnishing energy to the Cleveland Railway Company when the Cedar Avenue power house has to be abandoned. In order to furnish this service, additions must be made to the municipal power plant, and Commissioner Davis is advocating a bond issue of $1,750,000 for the purpose of making the extensions.

EAST LIVERPOOL, OHIO. — An ordinance to issue $15,000 in bonds to provide funds to engage a lighting engineer to rearrange the street-lighting system has been passed by the City Council.

FREMONT, OHIO—The City Council has passed the Herbrand ordinance, which allows the Herbrand Company to expand its plant. The company proposes to erect a new power house and complete plant for a railway switch system, at a cost of more than $200,000.

LONDON, OHIO.—Bonds to the amount of $25,000 have been voted for enlarging and improvements to the municipal electric-light plant.

MASSILLON, OHIO.—The City Council has authorized the installation of an ornamental street-lighting system, for which bids are now being asked. Plans provide for iron posts and tungsten lamps.

MEDINA, OHIO.—The Ohio Gas & Electric Company has acquired the plant of the Medina Electric Light & Power Company. Extensions and improvements are contemplated to the system.

MIDDLETOWN, OHIO.—The Ohio Gas & Electric Company has decided to secure energy from the station of the Union Gas & Electric Company at Cincinnati. The Public Utilities Commission has granted the Ohio company permission to issue bonds to provide funds for the erection of a high-tension transmission line, to cost about $90,000.

SPRINGFIELD, OHIO.—The contract for installing electric wiring and equipment at the new municipal garage has been awarded to the Crain & Desormoux Company of Springfield.

FLEMINGSBURG, KY.—Orders, it is reported, have been placed by the Flemingsburg Light & Ice Company for a new engine and generator for its plant.

FRANKLIN, KY.—Application for an electric-light franchise in Franklin has been made by S. Walton Forgy of Elkton, Ky., representing capitalists who have acquired the property of the Franklin Electric & Ice Company. The new owners, it is said, contemplate improvements to the property, involving an expenditure of about $13,000.

LOUISVILLE, KY.—The contract for electrical fixtures, etc., for the Tyler Hotel has been awarded to Henry J. Rueff Company of Louisville at $4,584.

LOUISVILLE, KY.—The Louisville & Nashville Railroad Company, it is reported, has decided to replace all oil headlamps on locomotives in its service with electric headlamps.

MIDDLESBORO, KY.—Steps have been taken by local business men for the installation of an ornamental lighting system on Cumberland Avenue.

PRINCETON, KY.—The property of the Princeton Light & Power Company has been purchased by the Kentucky Light & Power Company of Hartford, Ky.

BLOOMFIELD, IND.—Contracts have been awarded to the Utilities Development Corporation of Chicago, Ill., for construction of power station and erection of more than 100 miles of transmission lines for the Indiana Power & Water Company of Bloomfield. The initial installation provides for about 5000 kw. and contracts have been made with several cities in adjacent territory for energy. The Indiana company has also contracted to supply power to some of the large coal mines in what is known as the Bicknell district. The company owns the Linn Coal Mine at Bicknell. The Indiana Power & Water Company was recently incorporated to take over the electric utilities in Worthington, Bloomfield, Odon, Elnora, Bicknell, and other towns in the White River Valley.

GARY, IND.—The contract for the erection of a high-tension line between Gary and Crown Point, a distance of 17 miles, for the Calumet Electrical Company of Gary has been awarded to Thomas G. Hamilton Company of Gary, at $65,000. The line will extend from East Gary through Hobart and Merrivale to Crown Point. In addition to the high-tension line, a quantity of 33,000-volt metering apparatus and supplies will be installed for the city of Crown Point, which heretofore has been supplied by the steam-driven plant in Crown Point.

HARTFORD CITY, IND.—The Muncie (Ind.) Electric Light Company contemplates improvements to its local system, involving an expenditure of about $10,000.

MUNCIE, IND.—The City Council is considering a proposal submitted by the Muncie Electric Light Company for the purchase of the municipal electric light distribution system. The company offers to pay the city about $14,200 for the distribution system and agrees to install from 175 to 200 ornamental lamps on the principal downtown streets and also to make a reduction in the price of street lamps, and to reduce its rates for electricity for domestic use.

TROY, IND. — The local electric-light plant is reported to have been purchased by J. C. Emmick.

BURNSIDE, ILL.—The installation of an electric-light plant in Burnside is under consideration. John Wright is reported interested.

ROCK ISLAND, ILL.—Bids will be received at the office of the commanding officer, Rock Island, Arsenal, Ill., until Oct. 5 under circular No. 112 for furnishing and installing coal-handling equipment in boiler house F at this arsenal. Bids will also be received until Sept. 26 under proposal No. 274 for furnishing 500 lb. pure aluminum wire and 100 lb. German silver wire. Bids will also be received until Sept. 25, under proposal No. 258, for furnishing one air compressor complete, similar to that manufactured by the Benjamin Electric Manufacturing Company of Chicago, Ill., for punch presses. For further information address the commanding officer.

SALINEVILLE, ILL.—The power house of the Storm-Loomis Coal Company of Salineville was recently destroyed by fire. The plant, it is understood, will be rebuilt.

ORFORDVILLE, WIS.—The Orfordville Light & Power Company contemplates the installation of a 120-hp. oil-burning Diesel engine.

BRONSON, MINN.—The installation of a street-lighting system in Bronson is under consideration. Energy will probably be obtained from the plant in Hallock, Minn.

GILBERT, MINN.—The Water and Light Commission has decided to advertise for brackets for the ornamental lighting system. These brackets will be put on trolley poles and will be used to carry the guy wires and lamps.

SANDSTONE, MINN.—The local electric-light plant, it is reported, has been acquired by the Cloquet (Minn.) Electric Company, which proposes to supply electricity from its plant in Cloquet to operate the system here.

ZUMBROTA, MINN.—The Northern States Power Company has practically completed the construction of a high-tension transmission line from Zumbrota to Pine Island, a distance of 21 miles. Work has begun on the erection of an 11-mile transmission line connecting Mantorville and Kasson to the main transmission system of the company.

WATERLOO, IOWA.—Bids will be received by the board of education of the independent school district of East Waterloo, 414 First National Bank Building, Waterloo, Iowa., until Oct. 18 for construction of high school building as follows: (1) General contract work; (2) heating and ventilating; (3) plumbing, sewering and gasfitting; (4) painting; (5) electric wiring; (6) clocks, bells and telephones. Plans and specifications may be obtained on application to Mortimer B. Cleveland, architect, 308 First National Bank Building, Waterloo.

KANSAS CITY, MO.—The contract for the lighting system for Swope Park has been awarded to the Kansas City Electrical Construction Company, at $15,085. The plans provide for about 150 lamps mounted on ornamental standards, maintained by underground wires.

TRENTON, MO.—Bids will be received by the city of Trenton until Oct. 11, for construction of a filter plant having a daily capacity of 1,200,000 gal. per day. Bids will also be received on two 1000-gal. per minute, motor-driven centrifugal pumps and one 62½-kva. generator, directly connected to a unaflow engine. Specifications may be obtained from E. E. Harper, consulting engineer, 2404 East Thirtieth Street, Kansas City, Mo.

GRAND FORKS, N. D.—Investigations are being made by the city of Grand Forks with a view of making improvements to the street-lighting system. W. E. Skinner, of Minneapolis, Minn., consulting engineer, has been engaged to take charge of the work.

MINOT, N. D.—Bids, it is reported, will soon be asked for furnishing 120 ornamental lamp standards for extensions to the ornamental lighting system.

BLUE HILL, NEB.—Contract has been awarded for construction of a new brick building for the municipal electric-light plant. C. C. Dickson is superintendent.

HELVEY, NEB.—The installation of an electric-lighting system in Helvey is under consideration by the City Council.

STERLING, NEB.—Preliminary work and surveys have been completed by the Sterling Light & Power Company for the erection of about 50 miles of three-phase, 13,200-volt transmission line. When completed this line will supply electricity in the towns of Douglas, Burr, Panama, Holland,

Firth and Hickman from the Central Station at Sterling. New equipment, including engines and generators, will be installed at Sterling. W. W. Marks is general manager.

BRIDGEPORT, KAN.—The Council has accepted the proposal of the Gypsum (Kan.) Light & Power Company to install an electrical-lighting system in Bridgeport.

JETMORE, KAN.—Bonds to the amount of $10,000 have been voted for the purchase of a new engine and other improvements to the light and water plants.

McPHERSON, KAN.—Plans are being considered for extensions to the municipal electric-light plant and water-works system.

Southern States

DAMASCUS, GA.—The installation of an electric-light plant and waterworks system is under consideration.

MILLEDGEVILLE, GA.—The installation of an electric-light plant at the State Farm in Milledgeville is under consideration by the Georgia Prison Commission.

NEWBORN, GA.—Bonds to the amount of $3,000 have been voted for the installation of a street-lighting system in Newburn.

HAVANA, FLA.—Bids will be received by the Board of Public Works until Oct. 23 for the installation of an electric-light plant and water-works system. Plans and specifications are on file in the above office.

JACKSONVILLE, FLA.—Bids will be received by the Board of Bond Trustees of the city of Jacksonville until Oct. 4 for furnishing and erecting at the Jacksonville water-works pumping station, on foundation to be provided by the city, one horizontal cross compound, crank and fly wheel pumping engine with a capacity of 12,000,000 gal. in 24 hours. Specifications, etc., may be obtained at the office of the commissioner of public works, Water Department, Engineer Building, Jacksonville.

PLANT CITY, FLA.—A company has been organized to take over the properties of the Plant City Ice & Power Company. Various improvements are contemplated by the new company, including the erection of a new building, extensions to lighting system, increasing capacity of ice factory and cold storage plant. Roscoe Nettles, recently granted a franchise to build electric and gas plants, is secretary, treasurer and manager of the new company.

ANNISTON, ALA.—Plans have been prepared by the Alabama Power Company of Birmingham for construction of five electric steel furnaces at Anniston, to cost about $1,000,000. James Mitchell, 120 Broadway, New York, N. Y., is president.

BIRMINGHAM, ALA.—The McClary-Jemison Machinery Company is considering the purchase of three 150-kw., 550-volt, direct-current, engine type, generators, complete with switchboard. Turbine driven units will also be considered.

MOBILE, ALA.—Plans have been prepared for the Louisville & Nashville Railroad Company for rehabilitating coal docks. The cost including machinery is estimated at $78,600. Electrically operated hoists will be installed.

McGEE, ARK.—The McGee Water & Light District is planning to install a 150 to 175-hp. oil engine to be directly connected to a 130-kva., three-phase, 60-cycle, 2300-volt alternator, with exciter and switchboard panel. The district would like to receive prices on the above equipment. H. W. Wright is superintendent.

ALVA, OKLA.—Preparations are being made for the installation of an electric-light plant in Alva. O. A. Hunt of Watonga is interested.

OKEMAH, OKLA.—The Water and Light Department is considering the installation of an ice plant in connection with the water and light systems soon. A. E. Finney is superintendent.

MIAMI, TEX.—Bonds to the amount of $25,000 have been sold, the proceeds to be used for an electric-light plant and water-works system.

PORT ARTHUR, TEX.—The contract for electrical work for high school for the Independent School District has been awarded to the Newberry Electric Company of Houston, at $5,910.

ROWENA, TEX.—Plans are being considered for the installation of an electric-lighting system in Rowena. Energy will be secured from the high-tension line extending from San Angelo to Winters. A number of other small towns are considering securing electrical service from the same source.

SAN ANTONIO, TEX.—The Houston, Richmond & Western Traction Company, organized to construct an interurban electric railway from San Antonio to Houston (a distance of 225 miles), has been reorganized under the name of the San Antonio, Gonzales & Houston Interurban Company. The construction of an electric power plant is included in the project. Steeve Holmes of Leesville, Tex., has been appointed president, succeeding C. C. Godman of Kansas City, Mo.

Pacific States

DAVENPORT, WASH.—The Washington Water Power Company of Spokane, it is reported, contemplates extending its transmission lines to the Standard Oil Station and to a farming community near Davenport.

HOQUIAM, WASH.—The City Council has decided to engage F. S. Burrows of Spokane as consulting engineer to make investigations in connection with the city taking over the local electric-lighting system, to be owned and operated by the municipality. If the report is favorable the proposition of a municipal lighting system will be submitted to the voters.

KELSO, WASH.—The North Coast Power Company of Portland contemplates improvements to its system in and near Kelso. B. M. Atkins is local manager.

MOUNT VERNON, WASH.—The Pacific Northwest Traction Company contemplates the immediate extension of its electric transmission lines in this section, particularly in the district south of Conway. Plans have been prepared for the installation of an electrically-driven power station at Conway. The cost of the line to Conway is estimated at $15,000.

SEATTLE, WASH.—The contract for electrical work in the new department store to be erected at the corner of Fifth Avenue and Pine treet, Seattle, for Frederick & Nelson, at a cost of $1,250,000, has been awarded to the J. J. Agutter Company, 622 Fourth Avenue, Seattle.

VANCOUVER, WASH.—The North Coast Power Company contemplates improvements to its system, in Vancouver, involving an expenditure of $60,000, providing certain ordinances it is furthering is passed.

ASTORIA, ORE.—The City Council has passed an ordinance requiring all light and telephone wires to be placed underground on Commercial Street from Tenth to Seventeenth Street, and on Bond Street from Tenth to Fourteenth Street; in other sections of the downtown district, wires are to be renewed, reclassified, and the poling system improved along modern lines. The cost of the change to the Pacific Power & Light Company is estimated at about $50,000 and to the telephone company about $20,000. J. E. Davidson is general manager of the Pacific company.

HOOD RIVER, ORE.—Preparations are being made by the Portland Railway, Light & Power Company to extend its transmission lines across the Columbia River, connecting the local plants with the Husum plant on White Salmon River.

KLAMATH FALLS, ORE.—Application has been made by the Keno (Ore.) Power Company for a franchise in Klamath Falls.

RIDDLE, ORE.—The town of Riddle is planning to secure electricity from the proposed municipal electric-light plant in Myrtle Creek.

BAKERSFIELD, CAL.—The Southern Sierras Power Company of Denver, Col., has applied for a 50-year franchise to erect and operate electric pole and tower transmission system on the public roads and highways in Kern County. Bids for the above franchise will be received by the Board of Supervisors of Kern County until Oct. 7.

CHICO, CAL.—The installation of a new street-lighting system in Chico is under consideration.

LOS ANGELES, CAL.—The City Council has approved an appropriation of $38,500 to continue the power development work on Crook Creek in the upper reaches of the Owens River country.

OROVILLE, CAL.—The Oroville Electric Corporation contemplates the construction of a dredger, to cost about $400,000, for use in the placer fields near Thermalito. R. Leo Van der Naillen is general manager.

SAN FRANCISCO, CAL.—The construction of a hydroelectric plant to cost $150,000, near Cascade station, in the Yosemite country, has been decided upon by the Government.

SAN FRANCISCO, CAL.—The California-Oregon Power Company of San Francisco has filed application for an extension of time within which to comply with the State laws concerning the erection of pole lines.

SAN LEANDRO, CAL.—The City Trustees have given orders that all telephone wires in the business district of the city must be placed underground.

YOSEMITE, CAL.—Bids will be received at the office of the supervisor of Yosemite National Park, Yosemite, Cal., until Oct. 12 for furnishing or installation or both of hydroelectric equipment for the park, consisting of water wheels, generators, transformers, and switchboard, in accordance with plans and specifications, copies of which may be obtained from W. H. Lewis, supervisor, Yosemite, Cal., or from Galloway & Markwart, 723 First National Bank Building, San Francisco. Proposals will be received for subdivisions of the work.

KENDRICK, IDAHO.—The Potlatch Consolidated Electric Company of Kendrick contemplates the erection of a 33,000-volt transmission line to connect with the lines of the Washington Water Power Company at Moscow, a distance of 12.3 miles. A. V. Dunkle is manager.

SALE LAKE CITY, UTAH—The County Commissioners have given tentative approval of the installation of an aerial tramway at the county silica bed, in order that the electric company may proceed with the installation.

TEMPE, ARIZ.—The City Council is considering calling an election to vote on the proposal to issue bonds for municipal electric-lighting system. The purchase of the property of the South Side Gas & Electric Company for the installation of a new plant is under consideration.

ABSAROKEE, MONT.—An electric plant to develop about 300 hp. is being installed at Absarokee to replace the present plant which is too small to meet the present demands. A new generator and other machinery will be installed. The plant will be driven by a turbine wheel. Edward Reber is owner.

LAUREL, MONT.—Bids will be received by the city of Laurel, Mont., until Oct. 3 for the erection of 43 five-lamp, four-arm ornamental lamp standards. For details see proposal columns.

SUPERIOR, MONT.—A power plant will be installed by H. Schoenfeld and E. J. Edwards to supply electricity in th towns of Superior and Iron Mountain. The proposed plant will have a capacity of 100 hp.

CRAIG, COL.—The Meeker (Col.) Electric Company has applied to the City Council for a franchise to construct and operate an electric-light plant in Craig. William Laidlaw of Meeker is owner and manager.

ESTES PARK, COL.—The City Council, it is reported, is considering the purchase of the local electric-light plant, owned by the Stanley Park Electric Light & Power Company. Extensions will be made to the plant if taken over by the city.

Canada

McADAMS, N. B.—The Canadian Pacific Railway Company has awarded the contract for the construction of power house and other buildings to Henry Post of Woodstock. The cost of buildings is estimated at $50,000.

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Oct. 3 for air compressor, brake beams, fusible plugs, grommets, marine lamps, ejectors, steam gages, engine lubricators, grease cups, clocks, etc. Blanks and general information relating to this circular (No. 1081) may be obtained at the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

SUDBURY, ONT.—The British-Canadian Nickel Company, it is reported, is planning to install a hydroelectric plant to supply power to its refinery which it proposes to erect in Sudbury.

TAVISTOCK, ONT.—Plans are being considered by the Town Council for the installation of a hydroelectric system.

Miscellaneous

ANCHORAGE, ALASKA.—Ground, it is reported, has been broken by the Alaska Engineering Commission for the construction of an electric power plant in Anchorage, to cost about $50,000, exclusive of distribution system. The equipment will include two batteries of two boilers each, having a rating of 185 hp., and 100-kw. alternating-current turbo-generators. Contract has been placed for smoke stack.

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Sept. 28 for furnishing iron boilers, cable clips, sheet brass, copper tubing, steam gages, watt-hr. meters, transformer, galvanized conduit, wooden plugs, knife switches, electric wire and bond paper. For further information address Major Earl I. Brown, general purchasing officer.

1,197,626. Production of Refractory Materials; P. R. Hershman, Chicago, Ill. App. filed Dec. 21, 1914. Refractory bricks for metallurgical purposes.

1,197,628. Regulation of Electrical Distribution Systems; P. C. Hewitt, N. Y. App. filed March 17, 1903. Vapor converter system for storing and giving out energy.

1,197,629. Vapor Electric Apparatus; P. C. Hewitt, Ringwood Manor, N. J. App. filed Sept. 19, 1912. Ultra-violet rays for sterilizing.

1,197,644. Adjusting Device for Box Covers; W. H. Lutz, Philadelphia, Pa. App. filed Jan. 15, 1913. Cam auuulus for leveling floox boxes.

1,197,659. Insulator Support; C. L. Peirce, Jr., Pittsburgh, Pa. App. filed Feb. 5, 1916. Built up from flat sheet metal.

1,197,660. Insulator Support; C. L. Peirce, Jr., Pittsburgh, Pa. App. filed Feb. 5, 1916. Sheet metal structure.

1,197,686. Vapor Electric Apparatus; P. H. Thomas, Upper Montclair, N. J. App. filed Oct. 19, 1911. For exciting mercury vapor rectifiers.

1,197,687. Vapor Electric Apparatus; P. H. Thomas, Upper Montclair, N. J. App. filed Oct. 19, 1911. Exciting rectifiers leaving natural points of deficiency in the supply e.m.f.

1,197,691. Apparatus for the Control of Highway Crossing Signals; H. S. Wallace, Pittsburgh, Pa. App. filed March 27, 1915. Signals operated by insulated track sections.

1,197,705. Incandescent Electric Lamp; R. Winne, Schenectady, N. Y. App. filed April 24, 1913. Places in bulb with regenerative compound a small amount of nitrogen gas.

1,197,728. Casing for Engine Starter and Lighting Unit; F. E. Fisher, Detroit, Mich. App. filed Nov. 5, 1914. Chambered for motor and generator armatures.

1,197,736. Coin Holder; W. P. Hartford, and C. M. Rickoff, Chicago, Ill. App. filed Aug. 21, 1915. Coin closes current of illuminating device for advertising matter.

1,197,737. Method of Applying Active Material to Secondary Battery Plates; G. W. Hayden, Buffalo, N. Y. App. filed July 1, 1914. Density of the paste readily regulated.

1,197,739. Trunking; R. G. Hutchins, Chicago, Ill. App. filed July 26, 1915. For steam railways, to contain signal wires.

1,197,747. Apparatus for Governing the Speed of Railway Cars or Trains; C. H. Lay, Brooklyn, N. Y. App. filed Oct. 20, 1913. Signals controlled by track relays and slow-operating means.

1,197,749. Railway Signaling; R. A. McCann, New Brunswick, N. J. App. filed Oct. 31, 1912. For stretches of single track between passing sidings.

1,197,800. Starting Switch; C. F. Cuno, Meriden, Conn. App. filed Dec. 27, 1915. Secondard contact prevents burning of the main contacts.

1,197,816. Electric Accumulator; G. L. and G. J. A. Fuller, Bow, London, England. App. filed Nov. 27, 1915. Electrode of triangular form.

1,197,819. Key Operated Electric Switch; M. Guett, Hartford, Conn. App. filed Feb. 18, 1915. Push switch construction.

1,197,829. Quartz Lamp; F. G. Keyes, Boston, Mass. App. filed Feb. 10, 1913. Localizes passage of current out of the cathode, where "cathode spot" is produced.

1,197,835. Alternating-Current Hoist; D. L. Lindquist, Yonkers, N. Y. App. filed May 17, 1913. Controls by direct current generated by the motor.

1,197,853. Push-Button Connection for Electric Switches; C. D. Platt, Bridgeport Conn. App. filed Sept. 10, 1915. Readily attachable and not accidently separable.

1,197,862. Signaling Device; D. M. Scott, Kansas City, Kan. App. filed Oct. 11, 1915. Motor swings semaphore through worm-gear connection.

1,197,910. Electrical Sound Producing Systew and Apparatus; E. E. Clement. Washington, D. C. App. filed Aug. 28, 1911. Pipe or horn with self-contained operative unit.

Record of Electrical Patents

Notes on United States Patents issued Sept. 12, 1916, prepared by Mitchell & Allyn, 41 Park Row, New York.

1,197,954. Ground Terminal; A. R. Rheinberger, St. Paul, Minn. App. filed Jan. 15, 1914. Includes a wedging bar doubled upon itself.

1,197,957. Inclosed-Fuse Connector; J. Sachs, Hartford, Conn. App. filed Sept. 20, 1915. Usable for testing and switching.

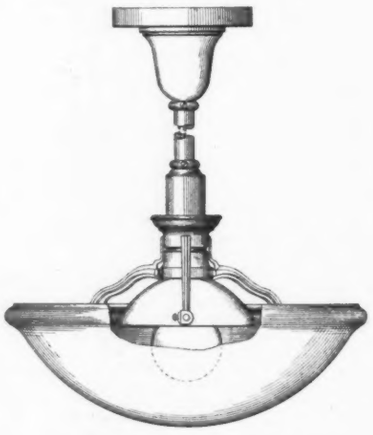
1,197,962. Lighting Fixture; E. M. Smith, Chicago, Ill. App. filed Feb. 11. 1916. Prevents formation of shadows.

1,197,970. Trolley Retriever; P. Thibodeau, Willimansett, Mass. App. filed Sept. 25, 1915. Utilizes compressed air.

1,197,978. Electromedical Apparatus; J. J. Warner, Parkersburg, W. Va. App. filed June 18, 1913. Conversion of direct current into alternating current.

1,197,989. Automatic Telephone System; C. S. Winston, Chicago, Ill. App. filed Aug. 5, 1912. Metallic line type.

1,197,990. Automatic Telephone System; C. S. Winston, Chicago, Ill. App. filed Sept. 30, 1912. Employs no slow-acting relays.



No. 1,197,962. Lighting Fixture

1,198,005. Toll Telephone System; A. E. Case, Marion, Ind. App. filed Feb. 9, 1914. Control of the meter.

1,198,018. High-Voltage Outlet Structure; C. LeG. Fortescue, Pittsburgh, Pa. App. filed May 11, 1914. High potential bushings insulating from structure and from the secondary windings.

1,198,021. Power Actuated Switch Control System; G. B. Gray, Pittsburgh, Pa. App. filed April 18. 1914. Switch machine is made self-protecting.

1,198,024. Electrolytic Apparatus; W. E. Greenwalt, Denver, Col. App. filed Dec. 14, 1911. Electrolysis of impure copper sulphate solutions.

1,198,038. Electric Switch; C. J. Klein. Milwaukee, Wis. App. filed Feb. 24, 1914. Double-entered push-button operation.

1,198,066. Primary Battery Electrode; C. B. Schoenmehl, Waterbury, Conn. App. filed April 23, 1912. Has an internal metal reinforcement.

1,198,070. Electric Musical Instrument; M. L. Severy, Arlington Heights, and G. B. Sinclair, Winthrop, Mass. App. filed Aug. 7, 1905. Strings vibrated by hammers or by magnetic pulsations.

1,198,072. Magneto Electric Machine for Combined Ignition and Illuminating Purposes; F. R. Simms, London, England. App. filed July 21, 1913. Permanent magnets for field of ignition armature only.

1,198,073. Electric Water Heater; M. Simos, St. Louis, Mo. App. nled Dec. 13, 1915. Spreads water into thin sheet.

1,198,074. Electrical Connector; H. S. Sines, Chicago, Ill. App. filed Jan. 28, 1915. Fastened to wire end with solder.

1,198,080. Dynamo Electric Machine; C. W. Starker, Pittsburgh, Pa., and G. L. S. Kronfeld, Wilkinsburgh, Pa. App. filed Aug. 28, 1915. Relatively light stator frame.

1,198,116. Electric Arc Furnace; C. O. A. Dovle, Notodden, Norway. App. filed April 13, 1915. Angularly adjustable electrode supports.

1,198,131. Insulator; R. P. Jackson, Edgewood Park, Pa. App. filed Oct. 2, 1914. Built-up porcelain structure with easily replaceable units.

1,198,137. Insulator; B. M. Lincoln, Pittsburgh, Pa. App. filed July 13, 1914. Built-up structure capable of standing severe mechanical shocks.

1,198,147. Warning Signal; A. N. Pierman, Newark, N. J. App. filed March 8, 1912. Contacts for electric arm mounted on bulb of reed horn.

1,198,158. Automatic Train Stopping Apparatus; W. A. Seeds, Cripple Creek, Col. App. filed June 2, 1914. Track device positioned by semaphore.

1,198,177. Railway Signaling Device; E. S. Wright, New York. App. filed Jan. 9, 1915. Operates cab signal if cars become uncoupled.

1,198,193. Fuse Plug; T. F. Cote, Prince Albert, Saskatchewan, Canada. App. filed Oct. 13, 1914. Screw plug with readily replaceable fuse wire.

1,198,212. Telephone Repeater; E. Grissinger, Buffalo, N. Y. App. filed Feb. 24, 1902. Special construction and circuits for sensitive reliable results (eighty-four claims).

1,198,213. Telephone Repeater; E. Grissinger, Buffalo, N. Y. App. filed Dec. 12, 1908. Variations in current can be increased in force.

1,198,214. Telephone System; E. Grissinger, Buffalo, N. Y. App. filed Nov. 18, 1911. Proportioned leakage resistances.

1,198,235. Alternating-Current Motor; H. W. Jeannin. Warren, Ohio. App. filed Jan. 29, 1916. Improved brush-holder.

1,198,239. Electric Flashlight; H. M. Koretzky, New York. App. filed Nov. 27, 1915. Made in semblance of watch.

1,198,270. Apparatus for Utilization of Signal Currents for Telegraphic, Radiotelegraphic, or Other Purposes; V. Poulsen, Frederiksberg, near Copenhagen, Denmark. App. filed March 5, 1915. Works at high speed under weak currents.

1,198,340. Electric Contact Making Device; E. Garretson, Buffalo, N. Y. App. filed Sept. 11, 1914. Knife-edge contacts.

1,198,345. Telephone Transmitter; E. Grissinger, Buffalo, N. Y. App. filed Nov. 18, 1911. Improves faithfulness of conversion of voice waves into electrical waves.

1,198,349. Method of Making Wire Mesh Fabrics; J. A. Heany, New York. App. filed May 25, 1915. Electrically welded wire cloth.

1,198,351. Apparatus for Making Wire Mesh Fabric; J. A. Heany, New York. App. filed Sept. 7, 1915. Welds fabric in tubular form and then splits it.

1,198,364. Fuse; H. H. McLaughlin, Knoxville, Tenn. App. filed June 29, 1915. Renewable cartridge fuse.

1,198,376. Thermostatic Switch or Cut-Off; W. B. C. Porter, Kennett, Mo. App. filed March 30, 1915. Particularly for dental vulcanizer.

1,198,381. Vapor Electric Apparatus; P. C. Hewitt, Ringwood Manor, N. J. App. filed Oct. 23, 1915. Rectifier for three-phase current.

1,198,385. Attachment for Trolley Poles; J. W. Oman, St. Louis, Mo. App. filed Sept. 25, 1914. For guiding trolley wire into groove on wheel.